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J. P. Beavan
in affectionate remembrance of
old times - Charles Shrimpton

may

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CHOLERA:

ITS

SEAT, NATURE, AND TREATMENT.

BY

CHARLES SHRIMPTON, M.D.,

Chevalier de la Légion d'Honneur,

Médaille du Cholera Decernée par la ville de Paris, 1832,

&c. &c.

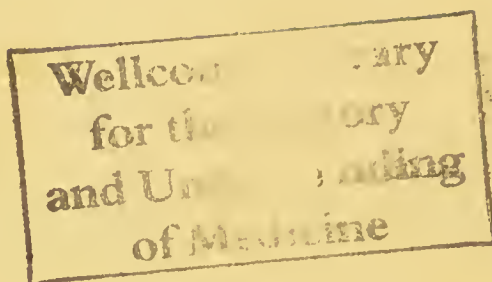


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Rue d'Anjou, St. Honoré, 17, Paris,

October 3rd, 1866.

My Dear Mr. Sambrooke,—To my many other great obligations I have now to add the favour of being allowed to dedicate this little work to you. You take such a lively interest in all subjects of the kind, that I was naturally anxious to associate your name with a question of such deep importance.

It was at your hospitable table, the rendezvous of the *elite* of the profession, that I had the advantage of meeting Dr. Beale, whose admirable microscopie researches have so marvellously confirmed my previsions. This is merely an incident in the life of one who has devoted himself to the highest undertakings.

You, with a noble friend, are, I believe, the two only surviving members of that Committee to which we owe the foundation of King's College Hospital. By your great liberality and paternal solicitude, not less than by your constant exertions in obtaining the support of the wealthy and generous, have you mainly contributed to raise this Institution to its high position amongst the first medical schools in Europe. You have thus conferred the greatest benefit on humanity, and assured the progress of science to rising generations for ages to come.

My admiration of the success with which your philanthropic efforts have been crowned is inseparable from a deep sense of personal gratitude.

Believe me then to be,

Dear Mr. Sambooke,

Yours, sincerely and gratefully attached;

CHARLES SHRIMPTON.

To T. G. Sambrooke, Esq.,
32, Eaton Place, London.

THIS treatise was originally written in French, and its publication retarded for some months by circumstances over which we had no control. Almost simultaneously with its appearance from the press, Dr. Beale has marvellously realized our previsions. His magnificent microscopic researches have already demonstrated the diseased state of the elementary cells of the villi of the intestinal canal, and we have no doubt that his labours will be crowned with success as he proceeds in his arduous task. We publish as an appendix to this little work the whole of Dr. Beale's valuable researches, contained in the *Medical Times* of August 4th and 18th, 1866. We here offer him our tribute of humble praise and admiration, with our best thanks for the kindness with which he has so readily assisted us on this important occasion.

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CHOLERA.

CHOLERA has been committing its fearful ravages, flying over the whole of Europe during the last thirty years, whilst all our efforts have been in vain to stay its course or mitigate its violence.

This terrible disease, which appeared to be confined to India, began to invade other countries in 1817, and made its appearance amongst us in 1832. Since then it has never left us, and from time to time it bursts out in disastrous epidemics, without our having been able yet to discover by what means it is propagated.

We have evidently here to contend with phenomena of a new character, and we must endeavour to study the nature of this unknown agent without allowing ourselves to be influenced by any preconceived notion.

Cholera presents itself in a character so widely different from other diseases, that none of our former theories can assist us in our researches on its nature, its origin, and its seat: we must be guided by the established data of science only.

There can be no doubt that this disease is propagated. Are we obliged on this account to declare that it is contagious? It is true that we know at present only of two modes, contagion and infection, by which diseases are propagated; but are we justified in declaring that a disease is contagious merely because we know of no other means by which it may be propagated? This subject has engaged much of our time and thought for many years, and we have never yet been able to discover any means by which it could possibly be contagious.

Another difficulty arises from the circumstance that Cholera has frequently been considered as an epidemic disease, and consequently, in giving faithful accounts of the different epidemics, it has been necessary to enter into all the details of complication, for Cholera associates itself easily with other diseases, and thus the efforts of some of our highest authorities have frequently been diverted from the proper channel in their search after the real nature of the disease. Our perception of this source of error has led us, in our study of the disease, carefully to isolate it from all its complications. We have at the same time avoided all speculations on the nature of epidemic influences, which we cannot fathom any more for Cholera than for many other diseases. Why then raise a problem which most probably we shall never be able to solve? This

may be the barrier that human intellect is not to pass—the *το θειον* of Hippocrates.

When visited, however, by such a devastating agent as Cholera, we cannot but inquire from whence such deadly power arises ; how it is propagated ; and what measures we can take to protect ourselves from it.

Who can tell from what source the deadly influence comes ? By some it is affirmed that it proceeds from one cause, by others from another : that it comes to us sometimes from one direction, sometimes from another ; even the very means by which the disease was supposed to have reached us, on the appearance of each epidemic, has been unhesitatingly pointed out. All this is very doubtful. We believe that we are nearer the truth in stating that Cholera has always remained with us in a sporadic state since 1832, and that it frequently becomes epidemic.

The practical questions to be solved are the two following :—

Is Cholera a contagious disease, or is it not ?

What are the rational means to be employed in the treatment of Cholera ?

It is urgent that the question of contagion should be categorically brought before us in the threefold interest of science, of social economy, and of individual security.

We cannot admit that Cholera can be a contagious disease. This conviction has gradually grown upon us from all that we have witnessed during the epidemics of 1832, 1849, 1853-54, 1865, and from what is now passing around us.

The clinical and pathological observations we have had such ample opportunities of making ; the study of the works and opinions of our most learned men who, some of them, widely differ in opinion from us, have only confirmed us more and more in continually bringing new proofs in support of our conviction.

It is of the highest possible importance that this question of contagion should be solved, for in it we find involved that of the nature of the disease itself. The solution of the question with regard to social economy, will enlighten us as to the real value of the quarantine laws, and as to the hygienic measures to be taken ; and with regard to individual security, we shall learn whether there be any danger or not in contact with Cholera patients.

Such a question cannot be solved by the mere accumulation of facts which may be always brought to contradict each other. It is from the study of the disease itself ; by a careful examination of the symptoms, of the progress, of the pathology and etiology of Cholera, that we may hope to throw some light on this hitherto mysterious agent. We believe that we shall find the same active principle

in all the elements of the disease, and be thus guided to its true nature and seat.

Symptoms and Progress.—Frequent dejections of a liquid resembling rice-water, cramps, suspension of all the secretions, suppression of urine, vomitings, præcordial oppression, breath cold and dry, tongue cold, weakness of voice, coldness of the surface of the body, particularly of the lower limbs, sunken eyes, and small pulse, form an assemblage of symptoms which cannot allow Cholera to be confounded with any other disease.

It is not necessary that all these symptoms should be as characteristic as we have described them to allow us to recognise the presence of Cholera, for the disease exists really from the moment that a patient is attacked with the frequent dejections, intestinal flux, which has been called “cholerine,” and which in a vast number of cases precedes the development of the other symptoms. This intestinal flux characterises the *first period* of the disease, and is of a very insidious nature. It is unaccompanied by any pain, and without any other disturbance of the general health beyond a slight diminution of vital power, and a vague feeling of uneasiness. Intestinal flux, it will be seen, is quite of a different character from diarrhœa, with which it should not be confounded. An error of this kind would occasion

the loss of much precious time, and lead to a wrong treatment.

Diarrhoea is characterised by frequent evacuations of liquid stercoraceous matter, accompanied with more or less pain, and an *increased action* (irritation) of the whole system of the digestive organs.

In Cholera the stomach and intestines, instead of being in a state of increased action, become the *passive recipient* of almost all the serum of the body. This intestinal flux of which we are now speaking is the result of the more or less rapid absorption of the serum from the blood, and from the whole of the organic structure. The first evacuations, which must naturally contain stercoraceous matter, soon become quite liquid and inodorous, and have no longer any trace of the ordinary excrement. These stools, which have been compared to rice-water, are composed of serum, in which float small pieces of coagulated albumen and epithelial cells.

Most frequently the intestinal flux is so slight that persons do not pay any attention to it. A slight degree of weakness and general uneasiness, anorexia, without disgust for food, a slight rumbling feeling in the bowels, frequent liquid evacuations, as if propelled by a syringe, without tenesma, or even any irritation in the region of the anus. Animal heat is diminished, the circulation and all the secretions are slightly impeded.

A vast number of persons are affected in this

way during the reign of an epidemic, and after a few days' continuance of this slight disturbance a certain feeling of comfort pervades the frame. This is the sign that a kind of reaction has taken place, and that all the functions have returned to their natural state. Persons who have been thus disturbed are often not even aware that they have been under the influence of Cholera. But things do not always go on so smoothly, and when patients suffer a little more it is already late, but medical advice should be obtained as quickly as possible. This stage of the disease requires prompt and good management, for, if not subdued, the symptoms, after a few days, often after a few hours, assume the character of confirmed Cholera.

This, the *second period*, which we have already described in giving the symptoms of confirmed Cholera, is most frequently of but short duration, merely a few hours, and the disease passes to the *third, algide, period*.

Cholera does not always proceed from stage to stage as we have just said. The most serious cases generally begin at once, by this last period passing over the two others. This is often the case at the beginning of the most violent epidemics, as in 1832.

Hematosiſ has ceaſed entirely, or nearly ſo ; the pulse is no longer felt at the wrists, and the breath has become abſolutely cold without any

vapour. The thirst is insatiable, with a sensation of burning heat in the epigastric and umbilical regions. Animal heat is no longer generated, and the characteristic cold of Cholera has seized the whole frame. The skin is cold, soft, and doughy, with a cold, viscous liquid filtering through its pores ; it has become flabby, and is shrivelled up, having lost the elasticity of living tissues ; it has a violet tint, with livid spots here and there. All the secretions are entirely suspended. The eyes are become dry, they appear to be diminished in volume, and are withdrawn to the back of the orbits. The tongue and the mucous membrane of the mouth are cold, with a bluish hue. The cramps which first attack the legs quickly extend to the arms, and from thence to the muscles of the abdomen and chest. The breathing is slow, and the action of the heart weaker. All the symptoms, cramps, vomitings, and intestinal flux, become more violent, and the patient suffers inexpressible anguish from the spasmodic contraction of the stomach and bowels ; he throws himself about in every direction, and complains of oppression, though air continues to enter the lungs abundantly. There is frequently delirium at this period.

When the end is drawing near, the violence of all these symptoms is abated, the vomitings, dejections, and spasmodic contractions cease from the exhaustion of the vital powers, and the patient expires in a few hours.

Period of Reaction.—When the disease is to have a more favourable termination, all the symptoms, instead of taking the more aggravated form, assume a milder character, and reaction takes place gradually.

The first sign of this favourable change is often the evacuation of a small quantity of urine, announcing the re-establishment of the other secretions. The skin loses its deadly coldness, becomes warmer by degrees, and is moistened with its natural perspiration. The animal heat returns, the pulse is developed, cyanosis gradually disappears. The breath becomes moist and warm. The stercoraceous evacuations re-appear. The secretion of the lachrymal glands is re-established, and the eyes are less sunken in the orbits. The voice recovers its tone. In a word, a total change has taken place. Reaction in Cholera is necessarily very slow, and when most promising it is mild and calm, the patient experiencing great comfort and desiring repose.

It rarely occurs that the transition is so easily accomplished. Most frequently a febrile movement takes place, which the patient overcomes after a few days of care and good management.

The disorder created in the whole system is, however, frequently so great that the reaction cannot be sufficiently supported, and the febrile state takes an adynamic form with all the accompanying

symptoms of typhoid fever; the tongue becomes red, dry, and fuliginous, with stupor, coma, or delirium. The intestines are inflated with gas, the abdomen distended and painful. Petechiæ appear on the skin, which becomes hot, dry, and is covered frequently with a kind of roseola, or a species of urticaria. Vomitings recommence, and bile is now abundantly rejected, frequently also diarrhœa with most offensive evacuations.

When the vital powers are thoroughly exhausted, and the patient has not strength to bear even the first efforts of reaction, the pulse, after a faint development, quickly becomes weak and thready; the skin does not keep up its warmth, and is again covered with a cold, clammy exudation; the general vitality gives way, and the patient sinks rapidly without any suffering.

Thus Cholera has four modes of termination.

1st. By mild and regular reaction without any apparent fever.

2nd. With fever, the patient retaining sufficient vital power to overcome the commotion.

3rd. The fever takes an adynamic or ataxic character—Typhoid fever.

4th. Vitality gives way without the power of reaction.

We must now pass on to pathology, which will account for all the symptoms we have been describing.

Our researches are necessarily confined to algide cases, that have succumbed without any reaction. All organic lesions which are produced by reaction cannot be the result of the influence of Cholera, which no longer exists. They therefore belong to other categories of diseases, most frequently of a typhoid character.

PATHOLOGY.

General state of the Body.—The general appearance of the body differs little from what it was during life, much resembling a case of asphyxia in an emaciated subject. The blue tint of the skin, with livid spots formed in the parts on which the bodies lie, have quite the same character and appearance as in asphyxia. The cadaverous rigidity is very marked. The skin is flabby, forming almost folds in some parts. The body is shrivelled up, as it were, by the abstraction of its serum, and is thus protected for a short time from putrefaction. The muscular fibres continue twitching during an hour after death; and the muscles contract, producing slight movements of a finger or a toe, or even of an arm or leg.

The phenomenon which strikes us the most is that the body becomes warm soon after death. This increase of temperature is very perceptible to the hand, and the thermometer when applied to

the groin rises one degree more after death than during life. This remarkable fact, which has struck all medical men, will assist us very considerably in our study of the nature of this disease. It is the result of the vital reaction of the elementary cells of the body after the disparition of Cholera and after death. This reaction is necessarily very transitory.

Under the same circumstances of temperature and atmospheric influence, putrefaction takes place more slowly in the bodies of choleraic than of other cases. The abdomen does not become green and violet—first sign of putrefaction—until several days after death. On opening the abdomen we do not find that peculiar cadaverous taint so constantly present in other bodies.

The peritoneum is covered with thick viscous serosity; the intestinal circonvolutions are agglutinated by the contact of the surfaces of the serous membrane, the parietes of these intestinal circonvolutions are contracted and appear thickened; they are soft and doughy, presenting here and there various colours, produced by the extravasations and arborisations of blood-vessels in the mucous membrane. There is no trace of stercoraceous matter or of bile in the intestines.

The stomach and intestines are more or less distended by the quantities of liquid they may accidentally contain. This liquid is of the same

nature as the evacuations, mixed with the drinks the patient took before death. The pyloric orifice is often contracted. The parietes of the stomach and intestines are thickened by infiltration and contracted. The extravasated blood and the arborised vessels of the mucous membrane generally occupy the lowest parts and disappear on compression, or on slight friction with the back of a scalpel, leaving the membrane perfectly white. The whole surface of the intestinal canal, particularly of the jejunum, is covered with a scattered kind of granular eruption, psorentery. The mucous membrane has the appearance of having been macerated. The supposed granulations are simply the effect of infiltration, for on dividing them with the scalpel, they almost disappear allowing a small quantity of serosity to escape.

The mesentery and omentum are in their natural state ; the trunks of their veins gorged with black blood.

The spleen is often smaller than usual and contains but little blood, whilst the *liver* is full of blood, particularly in the system of the vena porta.

The pancreas has nothing to remark.

The gall-bladder is generally distended with inspissated bile.

The kidneys are injected, and the papillæ are filled with a creamy white matter : the calices do

not contain any urine, the ureters are in their natural state.

The *bladder* is healthy, empty, and contracted.

The *lungs* are sound and shrunken. They are much lighter than in other cases, from the circumstance that the blood-vessels are quite empty.

The *pleuræ* are glutinous and adhesive, like the peritoneum.

The *pulmonary arteries*, as also the *right cavities of the heart*, are gorged with dark black, blood-like jelly, in the midst of which some clots of coagulated blood may be found.

The *pulmonary veins* and the *left cavities of the heart* contain scarcely any blood at all.

The *pericardium* is dry and glutinous.

The *heart* is soft and friable. Some extravasated blood is often found on the part on which it inclines, as well as on the pericardium.

The *arteries* are almost entirely empty, in a collapsed state, and the internal membrane stained here and there by blotches of blood—a post-mortem effect. A quantity of black, jelly-like looking blood is found in the larger ramifications.

All the large *trunks of the veins* are gorged with black uncoagulated blood, but the capillary vessels are collapsed, and quite empty.

Nervous system.—Head.—The sinuses of the dura-mater are full of black blood. Extravasations of blood are often found on the arachnoid,

which is not so dry and glutinous as the other serous membranes.

The *substance of the brain* appears to be healthy, but small drops of black blood appear on cutting it in slices. There is no perceptible change in the nerves of the cerebral or ganglionic system.

What, now, are the pathological signs characteristic of Cholera?

1st. The invincible cold which seizes the whole body.

2nd. The development of animal heat, *vi vitæ*, as soon as the choleraic influence has disappeared, even after death.

3rd. The kind of granular eruption on the mucous membrane of the intestinal canal.

4th. The liquids contained in the stomach and intestines, with the exception of the drinks, medicines, &c., are composed of nothing but serosity, in which small pieces of coagulated albumen and epithelial cells float, with a little mucus.

5th. The empty state of the arterial system whilst the venous trunks are gorged.

6th. The blood is much thicker and of a deeper colour than in its physiological state. It does not coagulate to form a clot which floats in the serum; no buffy coat is formed. The fibrine is dissolved, forming an homogeneous mass with the globules and the small quantity of remaining serum. The

globules appear shrivelled up when examined by the microscope.

7th. There is no urine in the urinary organs.

8th. The surface of the body is of a bluish colour, cyanosis. There are extravasations of blood here and there on the skin, and on the mucous membrane of the intestinal canal; sometimes also on the serous membranes, pleura, pericardium, peritoneum, and arachnoid.

9th. The expired air of Cholera patients has the same chemical composition as that of the atmosphere, but it is four or five degrees below the surrounding temperature.

In studying the ensemble of all these elements of the disease with care we cannot fail to observe the connexion between the phenomena of the disease and the relation which the symptoms and pathology of Cholera bear to each other. Let us hope that the deductions which follow may unveil the nature of the disease.

The constant phenomena observed in the ensemble of symptoms and pathology which characterize Cholera are: *the pathological cold; the impaired state of the respiration, and the suspension of hematosiſ; the intestinal flux.*

The pathological cold which suddenly seizes the whole frame is, without doubt, the prominent symptom of the disease. This is not simply a negative state, from the absence of animal heat,

but the effect of an active agent, and the temperature of the body is frequently four or five degrees below that of the surrounding atmosphere. This accounts for the difficulty encountered in warming a patient as long as the choleraic influence lasts. As soon as this influence ceases, even after decease, reaction takes place of itself.

The morbid choleraic influence evidently seizes the elementary cells of the whole economy, and as each individual cell is endowed with its own independent vitality, it has the power of reaction in itself even after the cessation of all the other functions.

Impaired State of the Functions of Respiration and Hematosis.—In slight affections the change in these functions is scarcely perceptible, but in the more serious cases it becomes more and more marked, with asphyxia as its highest point. Organic vitality is then suspended; the air penetrates abundantly into the lungs, which are sound, but reduced to quite a passive state, as in a dead body. The cold breath exhaled from the lungs in this pathological state is quite characteristic. The blood, no longer oxygenated, becomes thick, like jelly, passes with difficulty through the vessels, and saturated with carbonic acid gas, strikes every organ with stupor. The capillary vessels are collapsed and empty.

The Intestinal Flux is the first of all the symptoms we observe in slight cases of Cholera. This flux is necessarily more or less abundant in proportion to the rapidity of the absorption and the suspension of the secretions. With the appearance of this intestinal flux we can already discover the first dawning of all the other symptoms of the disease. The absorption of serosity appears to be the result of an altered state of the functions. All the secretions being impaired, hematosiis and the generation of animal heat being diminished by the choleraic influence, which strikes with more or less violence the very elements of organic life, and decomposes all the liquids of the body just as blood decomposes when left in a basin. The serosity, thus separated from all the other elements, is promptly absorbed and carried to the intestinal canal, which becomes a mere recipient for the accumulating liquid.

All the morbid phenomena of Cholera are accounted for by the perversion of vitality which invades the entire organism, penetrating even to its elementary cells.

In the most serious cases, when patients are carried off in a few hours, the pathological phenomena we have described have not had sufficient time to be established, and consequently scarcely any pathological traces are left.

From the moment the pathological cold begins

and hematosiſ is ſuſpended, the vital functions of the whole frame are greatly impaired ; there is already a beginning of a kind of ſtaſis of all the liquids, and a relaxed ſtate of the tiſſues ſomewhat of the ſame character as we find with moribunds.

Cholera is always declared at once, whatever may be the degree of invasion, conſequently there can be no period of incubation.

On the ſame ground the diſeaſe muſt be identical in all its periods, in its ſlighteſt as well as in its moſt ſevere form.

Cholera does not neceſſarily go through all its periods, the diſeaſe may terminate after a ſlight invasion, it may paſs at once from this to the period of aſphyxia without having gone through any preliminary ſtate.

Reaction.—As ſoon as reaction frankly takes place, all ſigns of Cholera gradually diſappear, and the diſeaſe aſſumes quite another character.

There can be no cure for Cholera without reaction, and this reaction, though almoſt imperceptible in the mildeſt caſes, is neceſſarily accompanied with more or leſs danger, in proportion to the violence of the attacks.

In the moſt mild caſes the general vitality ſuffers little, and the embarraſſments are but ſlight, ſtill they exiſt in degree, and in ſevere attacks the whole ſyſtem is more radically affected.

The enormous quantity of vitiated blood with which the viscera and the venous system are gorged must be put in movement, and hematosiis must be re-established before any permanent reaction can be accomplished.

The viscera, when roused from their state of torpor, are exposed to be over-excited by the return of arterial blood, thence the febrile state which the patient is not always able to bear.

The reaction, to be beneficial, must be mild, slow, and well supported. When the patients are too much exhausted they sink suddenly into a state of adynamia, from which it is difficult to make them rally.

These observations are leading us away from our subject, for the passive congestions and adynamic state which take place after reaction belong to quite another pathological order. We could not however pass them over in silence, for we are interested above all in learning how a patient can recover from Cholera. The next part of the subject we have before us is that of contagion.

Is Cholera a contagious disease, or is it not ?

The question presents itself naturally in this form representing the two parties so absolutely opposed to each other—contagionists and non-contagionists. We place ourselves in the second category, and it appears to us strange that whilst our convictions are continually being strengthened

by diligent and impartial inquiry, we see the number of our learned brethren, believers in the doctrine of contagion, increase every day, though they cannot produce any proof on which they found their doctrine.

If by contagion we are to understand the transmission of a disease from one person to another by any particular means, can it be by infection, by poison, or by any morbid production? We will answer each of these questions, but it appears to us that the nature of the disease, its seat, and mode of propagation preclude Cholera from even the possibility of its being a contagious disease.

Before we proceed to give the reasons on which we found our convictions, we think it right to give the opinions of the distinguished medical men who believe in the doctrine of contagion.

CONTAGION.

We place in the first rank the learned report of Dr. Briquet, which occupied many sittings of the Academy of Medicine. Dr. Briquet read this report in the name of a Commission appointed by the Academy to analyse the innumerable documents concentrated in the archives of the Academy. After giving a complete history of the disease, he passes in review all the different opinions on the

symptomatology of Cholera, and then says, "With regard to the propagation of the disease, our information is extremely contradictory ; the result, however, after the analysis of an immense number of facts, is that the disease spreads gradually, from house to house, from commune to commune, &c. We have examples of the most imposing character, both from their number and their authenticity, which would make it appear that Cholera is transmissible from one individual to another. However the Commission abstains from giving any opinion on a subject so difficult and so obscure. We place the facts before you, leaving every one to form his own opinion.

"Inoculations of matter taken from Cholera subjects have been tried by several experimentalists without any success, from which we must conclude that Cholera is not a virulent disease." (*Sitting of the Academy of Medicine, March 27th, 1866.*)

This report resumes the opinion of the Commission on all the documents presented to the Academy. From this general opinion we must descend to details, and give more development to the doctrine of contagion. We shall find all the arguments usually employed in support of this doctrine in a paper read before the Academy by Dr. Jules Worms, at the sitting of November 17th, 1865.

“ Since 1817, starting from the Delta of the Ganges, Cholera has always followed the most frequented lines of communication.

“ The progress of the disease has always corresponded with the rapidity of the means of travelling.

“ In a great number of cases the march of the disease has been in a direction quite contrary to the most violent atmospheric currents.

“ There is not a single case on the records of science in which an island or a harbour had been primitively affected without its having been visited by a vessel coming from some infected place.

“ When the disease reaches us by land, it is always at the frontier that the first cases of Cholera appear.

“ In an immense number of instances the infecting vessels had cases of Cholera on board. The same has always happened in large bodies of men who came from infected countries.

“ It has never happened that a considerable number of cases have appeared simultaneously in a body of men, on a vessel, or in any place, without some isolated cases before.

“ In a considerable number of epidemics the disease has been imported by known individuals, who had the disease in a more or less confirmed state.

“ Things soiled by the evacuations of Cholera patients during a voyage, when taken on shore, the passengers not having landed, have infected the persons who washed them. The power of infection lasts 20 days.

“ The gastro-intestinal diseases which are said to precede Cholera have been wanting in three-fourths of local epidemics. These diseases have very often also existed without having been followed by Cholera.

“ Most frequently the cases of Cholera which have appeared in a place have been followed by a certain number of others in the immediate vicinity (same house, same street, same quarter).

“ Cases which occur at a greater distance, and in considerable numbers, have always been separated from the first cases by an appreciable lapse of time.

“ Persons affected with Cholerine may produce Cholera in their immediate neighbourhood.

“ Elevated places are less affected than low ground.

“ The disease is more easily propagated in marshy ground and in buildings constructed on an alluvial soil than on silicious ground.

“ The proximity of animal and vegetable matters in a state of putrefaction has often been the focus of Cholera.

“ Absence of air and habitual filth have most

frequently coincided with the development of the foci of irradiation."

From this application of the theory of contagion to all the different circumstances in which the disease is supposed to be transmitted, it will be interesting to see how the contagionists account for the appearance of epidemics. We have a good example in the last year's epidemic, of which we find a report in the sitting of April 23rd, 1866, *Academie des Sciences*.

"On the Cholera of Egypt in its connection with the epidemic of Marseilles in 1865, by Dr. Grimaud (de Caux)." We here find the most precise account of the passage of Cholera through Egypt, and from thence to Marseilles.

"Cholera came by the fresh-water canal from Fell el Kebir by the market-women.

"Such was the march of Cholera in Egypt.

"It appeared at Suez on May 20th, at Damahour, near Alexandria, on May 22nd.

"It burst out at Alexandria on June 2nd.

"It then goes up the railway, at Beni Lacel it takes the branch to Zagazig, and reaches, by Fell el Kebir, the salt-water canal, committing the greatest ravages at *Ismailia, a place reputed to be one of the most healthy in the world*.

"If we now go to Marseilles we shall see that the fate of the *Stella* discharging her cargo on the Quay of the Joliette on June 11th, was, as

nearly as possible, the same as that of the English steamboat depositing its cargo on the shore at Suez, May 19th."

We find in this paper the following paragraph which we transcribe as an example of the most graphic description of contagion.

"The Cholera of the Isthmus has all the demonstrative value of a most successful experiment in a laboratory. What laboratory, indeed, could be more appropriate for such an experiment than this part of Egypt with its isolating desert, its one single railway, its fresh-water and its salt-water canals, all passing through the desert, and these groupings of workmen forcibly confined to their limited circumscriptions? Nothing could occur there to disturb a careful witness, in obliging him to have recourse to various hypotheses. The pestilence can be followed step by step. Wherever it may be found it may be discovered, not only from whence it came, but almost always by whom it came."

"Conclusion.--Patients affected with Cholera were imported from Alexandria to Marseilles by the *Stella* and other vessels, as it had been imported from Djedda to Suez by the English boat, and by other vessels accompanying it."

Dr. Grimaud (de Caux) continues his subject under the title "Propagation in the town of Marseilles after the arrival of the Arab pilgrims

June, 1865.”—(*Academie des Sciences, May 7th, 1866*).

“ It is necessary that I should enter into some circumstantial details to be enabled to explain thoroughly the mode of propagation of the disease. These details will show the degree of guarantee which my researches may claim from science.

“ As soon as I arrived at Marseilles I made known publicly the special object which brought me there : I said it was connected with the circumstances which had driven a vast number of the inhabitants from the town.

“ A simple visit to the superior authorities opened every door to me, and prepared a sympathetic reception for me everywhere.

“ An immense number of facts were communicated to me, which I had to reduce to their proper value, to divest them of the exaggerations with which the general alarm had coloured them. I had to search out the most important of these facts, to go to their source, to appreciate the immediate and further consequences. In a word, I had to give to each fact its proper value.

“ From this ensemble of my first researches the result was my conviction that Cholera existed at Marseilles long before the 23rd of July. Date given by the first official declaration.

“ On the 20th of September the emigration had amounted to 104,000 persons, and the mor-

tality had reached its maximum since the 16th. Fright and despair were marked in every countenance ; sadness and mourning everywhere.

“ Large fires were made in the streets, from which two very good results were obtained for the people : great amusement, which was visible from the animation which this sort of scene produced until very late at night. In this respect they were really ‘*feux de joie*.’ The other result was not less important in the eyes of the hygienist. These fires consumed the decayed wood, the filthy rags, receptacles of vermin and vehicles of bad smells, from which all the houses were thus thoroughly cleansed. These fires were established everywhere at Marseilles, and in the neighbourhood.

“ After having, with great danger, gone through all the quarters, visited the houses and the streets which were almost entirely depopulated by the emigration or death of the inhabitants, I had not yet discovered any fact which could prove that the disease came from without.

“ One thing I did know positively, which was that the disease first appeared in the old quarters, where the streets are narrow, opposite the fortifications of St. Jean and the new harbours.

“ I know, moreover, that in the night from the 14th to the 15th June two cases of Cholera had been found on the quay of the harbour of the Joliette, near the stairs of the Major.

“ Finally, I know, but only vaguely, and without any precise detail which could allow me to trace it to its source, that a vessel had brought some pilgrims from Mecca, and that several of these pilgrims had died.

“ However, the fact that two bodies of Cholera patients, taken from the stairs of the Major, and the fact of the manifestation of the epidemic in the same quarter, were so blended together that in all probability the decease of the Arabs, if the decease really did take place, had some relation to each other, perhaps even the relation of cause and effect.

“ I went to the municipality to examine the registers of the month of June. It was necessary to collect the deceases from the bulletins themselves. I had before me 758 pieces of paper of different dimensions and various handwritings to examine and decipher.

“ I was looking for cases of death from Cholera, and naturally I fixed my attention on the causes of death assigned to each individual. In the greater number of bulletins in which this cause was mentioned I found the one only indication, *natural death*. At Marseilles those deaths only which have been occasioned by some violent cause are specified.

“ The difficulty was very great. I thought at last that the Arabs had not a European name ;

and neglecting the causes of death, I returned to the bulletins to read the names.

“This is how I discovered the Arab Ben Kaddour : his certificate of death belongs to the 12th of June, in which day there were twenty deaths. This circumstance made me happy, for it was a real discovery.

“I had yet to learn whence this Ben Kaddour came. The declaration of decease had been made by two soldiers, Voltigeurs, of the 38th of the line, and the Aide-Major of the same regiment had signed the certificate of decease. The information obtained from the Aide-Major, Dr. Renard, led me to Captain Dol, the commander of the fortification of St. Jean, and from Captain Dol to the commissariat of the harbour, where I learnt that the *Stella*, which brought the pilgrims, is also the vessel by which it was first known at Marseilles that there was Cholera at Alexandria.

“I could not confine my researches to this. I wished to see with my own eyes the name of the Arab inscribed on the manifest of the *Stella*.

“This manifest was at the prefecture. I had to examine bundles of papers to find it. When I held it in my hand, I there saw something more than the name of *Hadj el arbi Ben Kaddour*. Instead of one dead pilgrim, I had now three, two of which had been thrown into the sea on June 9th.

“From this moment I believed and could affirm that Cholera reached Marseilles by sea (see *Comptes rendus*, t. lxi, p. 591), and from this time no one could deny it. I believed all the cases of Cholera of which I had heard. I had no longer the right to disbelieve any one of them without going to see them. I could believe the two sudden cases of the Major, the wife of the Genoa workman and his child dead of Cholera in the Rue St. Catherine, the house painter on the Mæsis, after he had passed the day there, &c., &c., &c.

“Notwithstanding, I was careful not to accept these facts without verification. They do not appear in my narration, because I did not verify them. They were not necessary. The turn that Cholera took was then the same at Marseilles as in Egypt. At Marseilles, as in Egypt, the first cases were in the neighbourhood of the spot where vessels arrive. At Marseilles, as in Egypt, the disease remained confined to the same place for many days. At Marseilles, as in Egypt, the conditions of salubrity were no security for public health.

“If we can trace the radiation of the disease better in Egypt than we can at Marseilles, it is because the means of communication are much more frequent in a populous city. The crowd moves in every direction ; the meetings, salutations, and contacts are infinite, and escape every kind of

supervision ; whilst in Egypt, with the limits of the desert, the railway, the canals, all is frontier, which can be watched with undoubted security."

We have made every effort to present the cause of the contagionists as favourably as possible, and we do not think it could be done more effectually than by choosing amongst their highest authorities, those who officially represent the two academies of science and medicine.

We have quoted from the conclusions only of the immense and learned report of Dr. Briquet, one of the most distinguished members of the Academy of Medicine, and we there find nothing but uncertainty and doubt. We first learn that, from the analysis of the greatest number of facts, the disease spreads gradually, from house to house, and that it is transmissible from one individual to another. "However the commission abstains from giving any opinion on a subject so difficult and so obscure. We place the facts before you, leaving every one to form his own opinion."

We find the same hesitation in other members of the Academy. Thus Dr. J. Guerin, who, like his colleague Dr. Briquet, was for a very long time intrusted with all these materials from which we hoped we might obtain the solution of the long disputed question of contagion, says *Gazette Medicale*, June 28th, 1866, "For, we repeat it, the disease introduced into a family into a house,

spreads like a spot of oil, gradually attacking all around it—everything that touches it.” . . . He continues in the next page, “All in the manifestation and in the progress of Cholera is still a mystery, and true observers would do well to continue to watch facts as they present themselves, leaving the theorists to their absolute systems.”

Thus after having affirmed in the most positive and absolute manner that Cholera is a contagious disease, he tells us that everything in the manifestation and progress of the disease “is still a mystery.”

In the paper we have quoted from Dr. Jules Worms, we find the same confusion as in a great number of authors who have confounded Cholera with the diseases with which it is so frequently complicated. Thus we find that all the propositions presented by Dr. J. Worms, except the third, which annuls all the others, are explicative of the means by which Typhoid, Yellow Fevers, the Plague, &c., are transmitted, but they are by no means applicable to the mode by which Cholera is propagated.

Finally, Dr. Grimaud (de Caux), in his account of the arrival of the pilgrims at Marseilles, thinks he has shown us contagion in the very act. He says seriously, “Instead of one dead pilgrim, I now had three; two of them had been thrown into the sea on June 9th. From this moment I believed and

could affirm that Cholera reached Marseilles by sea." Dr. Grimaud (de Caux) forgets however to tell us that these Arabs died of Cholera.

NON-CONTAGION.

Quotations from the partisans of contagion might have been continued without end, showing by their own arguments not only how completely they fail in establishing their case, but how frequently they defeat their cause by the most involuntary inconsistencies and serious mistakes, which furnish us with the best possible arguments against the doctrine of contagion. We must now present the question in its other form, that of non-contagion, and not contenting ourselves with opinions, however respectable they may be, we must bring forward facts, and those facts only which have been observed by the most irrefutable authorities. All personal convictions and private opinions must be laid aside, and our observations must be drawn from those immense foci in which all opinions are concentrated, to be discussed and analysed by the officially established authorities.

It is principally in the military services, under the influence of discipline and hierarchy, that the authorities can demand from their subordinates that attention and precision which are so necessary to obtain definite and satisfactory conclusions.

The medical inspectors, members of the Board of Health of Armies, who have before them the reports and opinions of all the medical officers in chief of the army and the hospitals are, above all others, competent to form an opinion on a question of such vast importance and so controverted.

Dr. Cazalas, one of the members of the Board of Health of the French army, read a most admirable paper on this subject before the Academy of Medicine on the 3rd of April, 1866, in which the doctrine of non-contagion of Cholera is most ably supported.

After proving that Cholera existed in the Crimea before the arrival of the troops, which are accused of having imported the disease, and after having given us numerous examples of the appearance of the disease in many regiments which had never had any communications with each other, &c., Dr. Cazalas tells us that, "From January 27th, 1855, to January 13th, 1856, the Hospital of the Military School of Constantinople specially appointed to receive Cholera cases from every quarter, received 1,488 cases, of which 658 died. All the worst cases were treated in the special wards of my personal service. The slight cases, and those which were not almost hopeless were dispersed, the first on their arrival, and the others as soon as convalescence began, in the wards of the ordinary patients. Well! Cholera was not only not pro-

pagated in the wards of the ordinary patients, or in the populous neighbourhood of the establishment, but not one of the persons belonging to the hospital (physicians, nurses, sisters of charity, priests, apothecaries, and officers of administration) living daily in the midst of these cases of Cholera, ever presented, during the whole of this long lapse of time, one single symptom of Cholera, or of infection from the disease."

We shall have occasion to return to this important paper, in which we shall find information of the highest value relative to the invasion of the epidemic at Marseilles, &c., &c. But before entering on this part of our question, we must answer the propositions of our adversaries, and we cannot do this more effectually than by placing before our readers some citations from the works of James Amesley, 1831, of William Twining, 1855, and Sir James Ronald Martin, 1861.

These physicians of the Indian army and hospitals speak with authority on the subject, from the fact of their having made these observations on the spot where the disease first appeared, and where it is endemical.

The following are the citations alluded to :—

"Without disputing the possibility of contagion in Cholera, even in the midst of and notwithstanding the thorough ventilations prevalent throughout India, I am bound to say that, although I may be

said to have lived in the midst of the disease during many years, I have never seen anything which, in my opinion, warranted the belief, nor have I ever communicated with any Indian medical officer who believed in the contagiousness of epidemic Cholera in India." * *

"The Cholera epidemics have never, in any instance within my knowledge, been even supposed to have been imported *into* any of the ports of India, by ships from infected countries, or through any other manner of human intercourse."—*Influence of Tropical Climates*, by Sir J. R. Martin, p. 513.

"If the disease were contagious, the persons most exposed to contract Cholera in the General Hospital at Calcutta, would be those having charge of the bedding and clothing, and those employed in personal attendance on the patients. The man who has charge of the hospital clothing, and his assistant, both attend in the wards every morning, changing the bedding of one ward each day on ordinary occasions. But when Cholera exists, these people are obliged, in the majority of cases, to change some of the bedding of the patients having that disease daily, or oftener when soiled; for which purpose they come to the bedside, taking away with them the dirty bedding, which is given to the head washerman.

"Two clothes-keepers have been employed at this hospital in twenty-five years, and three head washermen during the period of twenty-four years;

none of these men have had Cholera, neither have any of the subordinate washermen or people employed about the clothing and bedding stores ever had the disease.

“The native dressers have daily the most unre-served communication with the sick, changing the applications over leech-bites, and the bandages to the arms of such as are bled, dressing blisters, and applying sinapisms; not one of these has ever suffered from the disease. Buctourie, the head native dresser, who instructs the subordinates, and attends with them alternately while at their duty, has been constantly employed at the hospital for twenty-six years. He is a clever man, of good character, and asserts that he has never known one of the hospital servants to be attacked with the disease.

“The sweepers who clean and change the close-stools, as well as the pans in which the matter vomited is received, and who wash such patients as may be helpless, have never been known to suffer from Cholera. It may be supposed that the occupations of the sweepers are usually such as might be expected to blunt their susceptibility to disease, or to the effects of any ordinary exposure; but this will not be urged respecting the Hindoo coolies, who are employed in attendance on the sick, and are obliged to be much in contact with all bad cases of Cholera, to keep the blankets from being thrown off, and the men from falling out of bed,

when in the worst stages of the disease, and suffering much from jactitation and restlessness. These coolies are also employed to rub and shampoo the extremities of the Cholera patients, and often cannot avoid inhaling the breath, as well as the exhalations from the bodies of patients in the most deplorable stages of the disease. Not one of these men has ever suffered an attack of Cholera. The young students, who are under a course of medical instruction, at the H. C. School for Native Doctors, are usually in attendance, and assisting at the hospital when Cholera is prevailing in a severe form, and when great numbers of patients are admitted with that disease. In March and April, 1827, when the hospital was unusually crowded with Cholera cases, and all the attendants much distressed and exhausted by the severe duty, a number of the young students from the school were brought to the hospital, and placed in attendance over the worst cases, being relieved regularly day and night. These young Asiatics performed their duties with great diligence, assiduity, and humanity for many days and nights, and none of them suffered by this constant exposure to whatever may be contagious in the emanations from Cholera patients, as well as the frequent contact of their persons. I publish these statements, after having made the most careful observations on this subject, when the disease has been prevailing during my residence at the hospital, and after the

most diligent inquiry relative to the same points during the last fourteen years."

A remarkable instance of exposure, with impunity, to any morbid causes arising from the person during Cholera is recorded at page 146 of this volume.

"By Mr. Henderson's account of the disease which raged on board the H. C. ship *Berwickshire*, in Bombay Harbour, in June, 1830, it appears that 94 men were taken ill of Cholera within a few days, of whom 38 died. A large proportion of the sick was landed and treated at the Bombay European Hospital, and 16 of the deaths occurred in that hospital, where there were at the time more than 100 patients and attendants, not one of whom contracted the disease." * *

"More than a hundred such instances may easily be collected by any one who will take the trouble to make critical inquiries respecting the history of Cholera for the last fifteen years."—*Twining*, vol. ii, pp. 181–186.

"The lapse of time between the existence of perfect health and of the full manifestation of disease was so short, that no such evidence of the intermediate changes as exists in contagious diseases generally could be detected in this malady. Very many also of those who were seized with the epidemic Cholera, neither saw nor came within the sphere of any other individual affected with the disorder." * *

“The sudden occurrence of the epidemic Cholera in particular stations and districts, the astonishing violence with which it appeared, the great numbers which were immediately and simultaneously seized with it, its very unexpected and quick decline, and its total disappearance after committing unheard-of ravages during a few days only, are circumstances wholly incompatible with the belief that it either originated in, or was diffused by means of contagion.” * *

“In illustration of the above statements, I may adduce what occurred in the hospital under my charge. Indeed, both in that hospital, and during the course of my whole experience of the disease elsewhere, no more than two cases occurred to me, which the most strenuous supporters of contagion in this disease could adduce in aid of their views; and these cases evidently appear to have arisen from a very different source than from contagion.” * *

“These patients were in a ward with between eighty and ninety persons, many of whom collected around their beds, and yet not one of that number was attacked with Cholera.” * *

“As the non-contagious nature of the disease is very generally admitted by the medical authorities of India who have had sufficient experience of the disease, and as this property is generally believed in by the community at large, I should

not have thought it necessary to advert to a contrary opinion, had not that opinion received the support of some distinguished medical authorities. I cannot, however, but think it unfortunate that the idea was ever suggested, because the dread of contagion may lead to serious consequences, inasmuch as it may withhold from the sick that assistance which they so much require. The strongest proof which I can adduce in opposition to it, came fully under my own experience, which has not been inconsiderable, and was derived chiefly from what I observed in the general hospital at Madras, whilst it was under my charge. This hospital generally contained from 170 to 200 patients, natives and Europeans; the wards were open, and a free communication existed between them; and yet, although patients were daily brought into them suffering under the epidemic Cholera, although these patients were indifferently distributed throughout the hospital, and consequently not secluded from the rest of its inmates, no more than five or six persons, exclusive of the two already noticed, were seized with the disease while patients in the hospital, during a period of five years; and certainly these cases could not be imputed in any degree to contagion. I can view them merely as cases of Cholera, occurring under circumstances of predisposition, during the prevalence of an epidemic

cause, and as showing even a much diminished ratio of attack to that observed where the disease prevailed.”—*Annesley*, pp. 208, 209, 212, 213, 215, 216, 217.

These citations might be considered quite sufficient to annul all the affirmations of the contagionists. But why should we go so far back in search of facts in support of our convictions, when we have them before us every day. We find a letter in the *Comptes rendus* of the sitting of the Academy of Medicine of the 28th of November. Dr. Fee, Member of the Academy, informs his colleagues that he has received a letter from Dr. l’Herminier, senior, dated November 8th, announcing that Cholera rages with great violence at Guadaloupe. Dr. Fee gives the following extract of his letter.

“ We have Cholera amongst us since October 22nd, without knowing whence it came. No suspected vessels have arrived in our harbour, no caravan from Mecca, no railroad to bring it to us. It originated in the marshes, and in sixteen days 150 persons have died ; 50 of whom were negroes, the others half-cast, besides four white creoles, three men and one woman, who were all in bad health and living in bad hygienic conditions. Here we have an introduction without any introducer—a most clearly proved case of spontaneous origin. The disease which was at first confined to the spot where it originated, soon spread to the town (Point

à Pitre) which is in the best possible condition of salubrity."

We now proceed to answer Dr. Grimaud (de Caux) and we have chosen the words of Dr. Didiot on the Cholera at Marseilles, because Dr. Didiot is a military man, *Medecin Principal des Hospitaux*, and as such he is subject to the control of his superior officers—the Inspectors, members of the Army Medical Board. He, in his military capacity, had to give an official report on the epidemic at Marseilles which he afterwards published, and from which we shall quote extensively, because it is an enquiry into the very facts reported by Dr. Grimaud.

"The official acknowledgment of the existence of the epidemic at Marseilles dates from the 23rd of July only, but it is undoubted that the disease appeared sporadically in the month of June ; even in the first week of that month cases occurred at intervals of a few days from each other. These cases were either not recognised at the time as cases of Cholera, or they were kept silent from fear of creating public alarm.

"Thus as early as June 6th, a drayman was attacked with algide Cholera from which he recovered : June 9th, there was a decease from Cholera in the Church of St. Laurent. *Now the Arab pilgrims, accused of having imported the disease from Egypt, had not yet arrived at Marseilles.* It is also remarkable that it was not

till the 2nd of June that the first case of Cholera appeared at Alexandria, and from the 12th of June that the disease took an epidemic character and penetrated to the interior of Egypt.”—(*Report of M. Aubert Roche on the Cholera of the Isthmus of Suez*).

But it was well known that there were cases of Cholerine, Cholera, as early as May 26th at Marseilles, and these cases increased considerably in number during the month following. The disease reigned there as an epidemic from May 26th to November 1st.

As it is not our wish to write a history of the epidemic, but merely to produce Dr. Didiot's work in comparison with Dr. Grimaud's report, we will at once come to the point which interests us at this moment. After some details concerning the soldiers who passed through Marseilles, 2,000 per diem, and on those that sojourned in the fortifications of St. Jean, Dr. Didiot says: “Well! this fortification of St. Jean so terribly accused by the contagionists, as were also the quays near the Joliette, had not one case of confirmed Cholera in this considerable population until September 8th, when a soldier of the 3rd batallion of African Infantry was attacked, *and even this one case was in consequence of drunkenness.*”

“Dr. Renard adds: amongst all the men passing through and lodged in the town, I was never

but once called to a case of Cholerine, which was on August the 27th, in the Rue d'Estelle for a soldier of the 63rd Infantry, a man of weak and exhausted constitution."

"From the simple statement of facts it is clearly shown that Cholera appeared at the same time at Marseilles and Alexandria: in the first of these two towns before the arrival of the pilgrims accused of having imported it, and in the second, after they had embarked for Europe.*

"Moreover, truth obliges us to put some of the facts presented to the *Academie des Sciences*† by Dr. Grimaud in their correct light and it will be easily seen that these facts are not only incorrect, but the interpretation which has been given them is completely forced."

"After diligent enquiry we learn the history of this wonderful *Stella* to which they have wrongfully imputed the importation of the pretended germ of Cholera from Alexandria to Marseilles.

"Sailed from Alexandria on June 1st, with 100 passengers, of whom 70 were pilgrims. She had two perfectly clean bills of health, and on the 7th was permitted to enter the harbour of Messina. On the 9th there were two deaths on board, one

* Letter from the captain of the *Stella* by M. E. Regnier, *Semaphore de Marseille*, No. of October 23rd.

† Sitzings of the 9th and 16th of October.

was a chronic case of dysentery, and the other, aged 75, had a cancer in his nose ; they were both Arabs. The two bodies were kept on board for more than twenty hours after death, and were thrown overboard on the 10th. The ship entered the harbour of la Joliette, at Marseilles, on the 11th.*

“ The pilgrims disembarked on the 12th, in the morning, and they entered the fortification of St. Jean about ten o'clock, having passed by the quays. At three o'clock two Arabs, who had remained on board, were brought on shore ; one of them had a broken leg, the other, Ben Kaddour, was an old man of 70, worn out by a chronic diarrhoea of very long standing, and for whom his comrades begged an admission to the hospital. Notwithstanding every effort, this permission could not be obtained the same day, and he died in the evening, about eight o'clock.

“ During the short passage of this Arab on the direct road from the fortification of St. Jean to the small battery, he uttered no complaint, he had no cramps nor vomitings, nor cyanosis, not one symptom in a word of a nature to strike the attention of the many persons who saw him and came in contact with him frequently.

“ The body was greatly emaciated, but without

* Captain Regnier's report to the Sanitary Administration.

any trace of cyanosis. The face and body were extremely white after they were washed. The body was seen after burial by a great number of soldiers, and by several children of the families that live in the fortification of St. Jean.”*

After all these official contradictions it may appear very strange, but it is not the less true, the report of Dr. Grimaud was judged by the *Academie des Sciences* worthy of being sent to the commission of the legacy Breant, for the prize ; it was also received as evidence that the Cholera of 1865 was imported to Marseilles by the Arab pilgrims. So far we have seen how little worthy of confidence it is, and as if to confirm all that Dr. Didiot had said, Colluchi Bey, the President of the Board of Health of Egypt, addresses a letter, dated May 18th, 1866, from Alexandria, to the *Gazette Medicale de Paris*, TO RECTIFY AN ERROR, stating officially that there was no case of Cholera on May 22nd, at Damahour, and that the disease did not appear in Egypt till June 11th, at Alexandria, twenty days after the date given by Dr. Grimaud, and ten days after the pilgrims had embarked for France.

It is impossible to obtain more precise informa-

* Details given by Messrs. Dol, captain commanding the fortification of St. Jean ; Jennesson, garde du génie, Maluet, porte-consigne ; Roche, casernier ; Desbarolles, army interpreter, and Corporal Dionnet, employed in the Arrival Office.

tion and of greater value than that furnished by Dr. Didiot.

We must now return to Dr. Cazalas, to see what he says on the origin of the epidemic at Marseilles. After giving the dates on which the Cholera appeared in all the hospitals and in all the garrisons of France, of Algeria, and of the Crimea, from the official reports of the epidemics of 1854 and 1865, addressed to the War Office by all the medical officers in chief of the hospitals and armies, he resumes it all in these words, "It appears to me impossible to see any more connection between the Cholera of Marseilles and that of Mezières, or Perpignan, than between the Cholera of Egypt and that of France. Does not this vast generalisation of the disease evidently prove that all France, or nearly so, was under the influence of a Cholerigenous atmosphere, that this influence developed itself spontaneously wherever the disease existed, and that its violence varied extremely in different localities?"

After some other details, Dr. Cazalas continues, "I could easily multiply facts of this nature, but it appears to me that those I have already furnished suffice to demonstrate evidently that Cholera was not imported, either in the East in 1854, by the French troops, or at Marseilles in 1865, by the pilgrims coming from Mecca, or at Algiers, in September 1865, by the military nurses."

When we see the disease breaking out on the same day, September 19, 1865, at Cette, Arles, Aix, and Courbevoie ; on October 1st, at Nancy and St. Cloud ; the 5th at Melun ; the 6th at Caen and St. Germain ; appearing simultaneously at distances so great from each other, how is it possible to prove that contagion spreads “gradually from commune to commune, from house to house, from individual to individual ?” No, the disease is not propagated in this way. Not only does the disease appear suddenly in persons the most distant from each other, but one or more persons may be attacked at the same time in a family, in a house, or in a public establishment. No one has ever seen Cholera transmitted from one individual to another. Cases are well known of children that had been suckled by their mothers affected with Cholera until the last moments of their existence, without having taken the disease. Again children at the breast that have died of Cholera have not given the disease to their mothers (*de la Berge et Monneret* Compendium, page 272).

If we were now asked what was our personal opinion on the manner in which Cholera is propagated we would answer as follows : the disease is not propagated by contagion, by infection, by poison, or by any emanation from the bodies of Cholera patients.

Everything in Cholera seems to preclude the

idea of contagion ; there is no period of incubation, no virus, no miasma ; even the nature of the disease itself, its seat, and its mode of propagation are quite opposed to all the principles of action of contagion.

“ *No Infection.*—Where are the ferments, the effluvia, the miasmata of Cholera? No one has ever discovered the least trace of these mephitic gases, of these microzoaires of which there has been so much talk. The atmosphere has not the less been infected with antiseptics and preparations of chlorures, &c., under the pretext of destroying these supposed microzoaires and neutralizing the supposed gases, of which there never has been the least trace discovered. Finally, have we not seen, and do we not every day see, that Cholera respects the most unhealthy places, and devastates others which are in the most perfect sanitary condition ?

“ *No Poison.*—We cannot help saying that in the embarrassment of finding a means of propagation for Cholera, and being determined that there should be one, the contagionists have been obliged to declare that there is poison, but the presence of this poison has never been shown, nor its nature explained.

“ *No Emanation.*—There is no emanation from the bodies of Cholera patients ; this would be equally impossible during life and after death.

During life the bodies are dried up and are cold, even below the temperature of the surrounding atmosphere ; the laws of chemistry as well as the laws of life are suspended, the very breath is cold—icy cold. Under such circumstances it is very evident that there never could be any emanation.

“ After death the bodies of Cholera patients do not immediately enter into decomposition, for after the cessation of the disease by death, the animal heat which could not be obtained during life, returns to the body for a short time, and thus prevents immediate decomposition. It is evident then that the bodies cannot produce those fetid emanations so much dreaded from deaths from zymotic causes.”*

Period of Incubation.—We have already said that Cholera has no period of incubation. Patients are always suddenly seized, there is no preliminary organic preparation, no shivering, no fever, as is always the case in contagious diseases—the plague, the yellow fever, typhus, small-pox, measles, scarlatina, &c., diseases which do not appear until many hours, and often many days, after the patients have been exposed to the specific morbid influence.

This period of incubation is necessary for con-

* Quotation from our own paper in the *Gazette Medicale de Paris*, 1866.

tagious diseases ; this interval is occupied by organic action in the elaboration of the elements of the new disease. In Cholera patients, instead of organic action we find a suspension of vital power throughout the whole economy. Thus, the essential condition of a period of incubation does not exist in Cholera.

With regard to Cholerine, we have shown that this is the expression of the mildest form of the disease itself.

Neither Virus nor Miasma.—There can be no virus without elaboration. Miasma, too, must be assimilated before it can act. Thus, it would be simply ridiculous to speak of the action of any virus or miasma where there can never be any elaboration or assimilation.

We find striking proofs of the non-existence of virus offered us by the contagionists themselves ; Dr. Briquet tells us in his report, already quoted, that no result could be obtained from the inoculation of different kinds of matter taken from Cholera patients.

With regard to miasma, it cannot be denied that Cholera exists where no trace of miasma can be found, as well as in the midst of the most pestiferous elements.

Although the transmission of the disease from man to animals presents conditions of a different nature from those of from man to man, we think

that the interesting experiments of Dr. Guyon may afford some useful information ; we will therefore reproduce a paper which he read on December 26th, 1865, before the Academie des Sciences.

“ I. *Experiments on Rabbits*.—On July 27th, five rabbits were set at liberty in two Cholera wards, three in one with the women, and two in the other with the men. The ward for men contained about half the number of patients that were in the other ward. August 3rd, another rabbit was added to the two with the men. I had two days before this injected some blood from an algide case into the abdomen of this rabbit, and the operation was not followed by any bad effects.

“ These animals ran about in the wards under the beds, where they were often covered with the sheets, the blankets, and other objects which had slipped from the beds, and they were frequently dirtied by the evacuations of the patients.

“ II. *Experiments on Fowls*.—From July 25th, two fowls were fed in part, one with crumbs of bread dipped in the white creamy matter of the small intestine, with some little pieces of mucus taken from the coats of the same intestine ; the other with bread dipped in the blood found in the cavities of the hearts of bodies of Cholera patients.

“ These two kinds of alimentation were obliged to be interrupted frequently, because the animals were easily tired of them, particularly the latter.

“III. *Experiments on Pigeons.*—From July 28th, two pigeons, each in a cage, were put into the dead-house, a narrow space with but very little light and air. The animals were thus exposed night and day to the emanations, if there could be any, from the bodies. There were always from six to twelve bodies in the dead-house.

“These three experiments were commenced on the 25th and 28th of July. On the 5th of August one rabbit was accidentally crushed. All the others, without any exception, the fowls and pigeons, lived till September 6th, the eve of the taking of Warsaw by the Russian army. Our observations on these animals could not be continued any longer. The next day they were all killed and eaten by the first soldiers that came into the hospital, notwithstanding all the observations made by the nurse who had charge of these animals, and who explained what they had been kept for. (This nurse should have inspired them with confidence, for he was a Russian who had been made prisoner by the Poles during the war.)

“The members of the Commission sent to Poland to study the Cholera in 1831 by the French Minister of Commerce and Public Works thus speak, though imperfectly, as will be seen, of these experiments :

“Dr. Guyon, member of the Commission sent

by the Minister of War, fed some young fowls with portions of intestine and various bits of Cholera bodies. He placed young rabbits in the Cholera wards of Bagatelle Hospital. All these experiments, which had been witnessed by many of us, were quite negative in their results; the animals did not suffer in any way.”—(*Report read to the Academy of Medicine, and returned to the Minister of Public Works, December, 1831, by Messrs. Alibert, Boudard, Dalmas, Dubled, and Sandras.*)

“IV. *Experiment with Leeches.*—A considerable number of leeches which had been applied to Cholera patients, some of whom had died, and others recovered, were put into separate vases; the leeches of those who had died into one vase, and of those who had recovered into another—the water frequently renewed in both vases. This was done during the last fifteen days of July, and all the leeches were alive in the first days of September, with the exception of five or six, as much of one as the other. Their death could not be attributed to the blood they had taken.”—(*Academie de Medicine, sitting of December 26, 1865.*)

To return to the subject of transmission of the disease from man to man, we must say that in a case of algide Cholera, which carries off a patient in a few hours, without leaving any pathological trace more than that found in simple cases of

asphyxia, it is impossible to admit the power of contagion.

The same observation must be made with regard to all the degrees of the disease, for the invasion is always sudden, and all the pathological traces—the psorentery, the ecchymoses, the stases of blood, &c., &c.—are all passive states.

There is nothing in the nature of Cholera which could make it transmissible from a sick to a healthy person.

In fact, it would be quite as rational to look for contagion in an individual whose death had been occasioned by fear, as in a case of Cholera. Fear, we know, is contagious, and in the same sense we admit that Cholera is so also.

Seat and Nature of the Disease.—The more or less complete suppression of all the secretions, and the suspension of organic life under the influence of Cholera, led us long since to think that the nervous system of organic life might be the seat of this terrible disease. This theory has been almost consecrated by science since Professor J. Cloquet has so clearly presented it to the Institute of France and to the Academy of Medicine.

Our opinion was so far correct, but we believe now that we can trace the influence much farther. It appears to us to seize the whole organism at once ; to affect all the functions at the same

moment, without any order of succession. The whole frame suffers; the influence of Cholera penetrates the most intimate structure, even beyond the last ramifications of the nervous system and of the circulation, *to the elementary cells of the whole economy.*

Each of these cells is endowed with his own vitality, and man, like all other organised beings, is formed by the agglomeration of all these vital units.

“It is then evident that the most perfectly organised being (man) is the result of a kind of reciprocal combination of the several elements which compose the individual: an agglomeration of separate existences dependent on each other, but this dependence is of such a nature that each element retains its own activity, and even when the others give an impulse, an excitement of any kind, to an element, the function does not the less emanate from the element itself.”—(*Pathologie Cellulaire de Virchow traduite par Paul Picard*, page 12.)

As in minerals, we have chemical compositions and decompositions by the affinity of atoms, so in organized beings have we assimilations and dissimilations by the vitality of the elementary cells. The nature of the disease appears then to consist in an altered state of the vitality of these cells, which are undoubtedly affected in Cholera. This will explain all the phenomena we observe

during the life and after the death of a Cholera patient ;—

The special cold of Cholera which seizes the whole frame ; the suspension of organic action, and of all the secretions. The rapid expulsion of the serum from the whole economy.

All these effects appear to be the result of an altered state of vitality in the very texture of the organs, of *the elementary cells* which compose all the tissues of the body. Without doubt our celebrated micrographs, Virchow, Beale, Ch. Robin, &c., will find these cells altered in their structure, as they have already found the globules of the blood shrivelled up in Cholera.*

All that we have advanced seems to be demonstrated by the fact that the reaction, the return of animal heat, takes place as soon as the influence of Cholera ceases, even after death. This reaction must then take place in the elementary cells, which are endowed with their own special vitality, independently of the general life, of the brain, of the heart, and of all the other functions of the economy.

The influence of Cholera appears to have acted on all the organic elements as if by lightning.

* See Appendix, page 94.

Mode of Propagation and Etiology.—If Cholera were a contagious disease, we should be able easily to follow it in its course from place to place, from date to date, to show how it was imported “by Arab pilgrims,” and even that it “came by the fresh-water canal from Fell-el-Keber by the market-women.” But as such is not the case, our task is much more difficult ; we shall have to follow it in all its meanderings, its erratic course, without any guide, in the hope of discovering something of its mode of propagation and its etiology.

The disease always makes its appearance in different distant parts of a country at the same moment, frequently even before it has visited the neighbouring countries. It is impossible to trace out its direct route. It leaps from north to south, from east to west, in every direction, and often to immense distances without touching the intermediate country.

It is impossible to establish the filiation of the disease when it declares itself suddenly in a city, in the centre of a country, where there has not been one single case of Cholera. Cases occur at the same instant in places not only the most distant from each other, but also without any possible communication between the patients ; in the cells of prisons, in convents, in hospitals, &c., &c., in the most healthy as well as in the most unhealthy places ; amongst all classes of society, the rich and poor ; the valid

and invalid. Thus this terrible disease appears to us to break through all the laws that contagious diseases are subject to.

Is it not then most unreasonable to inflict the rigours of quarantine laws on nations, to interrupt the intercourse between people, and to create terror, which never fails to spread the disease?

A *cordon sanitaire* was established at Dantzic, in 1831, outside the fortifications, and another in the harbour, and with a lazaret. In a word, all the measures of the quarantine laws were put in force. The disease appeared in the place notwithstanding all these restrictions, and then every house in which a Cholera case occurred was sequestered; the disease continued to spread more rapidly, and to rage more violently; of 1,387 patients, 1,010 died. Without doubt we shall be told, "You give us only one example; it is not always so." We answer that examples of this kind are but too frequent, and that the same causes will always be followed by the same effects.

We have here to deal with a sea-port, where every vessel can be rigorously inspected before it enters the harbour. Can these *cordons sanitaires*, these inspections, &c., be applied with any security to protection by land? We unhesitatingly say they cannot, for every measure that can be taken must be absolutely powerless in preventing communications between neighbouring countries. Since

then Cholera cannot be stayed, either by land or by sea, of what use are the quarantine laws? Again, if these laws and restrictions were effectual, could they always be applied?

The International Congress, which is still sitting at Constantinople to prevent the return of Cholera, has decided by a slight majority to cut off all communications between Egypt and the coasts of Arabia as soon as Cholera might appear again in this latter country.

The representatives of the Ottoman Empire and of Persia opposed this resolution, vigorously pointing out the serious consequences that must result from such a decision, if it were ever carried out. Their argument is irresistible. They say, "If you prevent the pilgrims from going to and fro on the sea, there will inevitably be a revolt, or a most dangerous commotion amongst the people. If the pilgrims are prevented from returning to their country, they will not be able to find food in Arabia, thus famine will be added to the epidemic, a formidable insurrection will follow, and the Porte will have to bear the consequences."

This resolution of the Congress cannot therefore be put into execution. It is evident that the most rigorous measures offer us no security against the invasion of Cholera. We do not yet know by what means the disease is propagated. It is very amusing then to watch the ingenuity of the most

passionate contagionists when they are put to the trial, and are obliged to account in some way or other for the inefficacy of the quarantines they impose on us.

In the *Gazette Medicale de Paris*, March 17th, 1866, under the head "Cholera-Morbus," by Dr. Eissen, editor of the *Gazette Medicale de Strasbourg*, we find the following paragraph:—"We have now learnt, without the possibility of any contestation, by the most patient and conscientious investigations, that these prodromic diarrhœas, these cholerines, are the most active means by which Cholera is propagated. Patients travel with perfect ease, and often recover spontaneously from these affections. *The propagation of Cholera is thus principally to be attributed to these travellers who deposit their dejections here and there, everywhere, unknown to any one.* These are the means by which the *cordons sanitaires* are deluded on land."

When we find our adversaries driven to such an explanation as this, we cannot help thinking that they speak without conviction. Their quarantines are always, and will always be established, either too soon or too late, for Cholera has always deluded them, and always will continue to do so.

We have already seen that though the Congress sitting at Constantinople had proclaimed

the necessity of quarantine laws, they found that these laws and restrictions could not always be applied. They now avow that quarantine is not always necessary for "it is very true," says the Congress, "that the steam-boats which have for many years been employed in the Indian service, have never imported Cholera to Suez, so that it may be said without entering into more particulars, that everything coming from a country affected with Cholera is not capable of transmitting the disease."

We presume to think that a disease must be contagious or not. Surely the example we have here quoted from the partizans of contagion cannot be suspected, and it is of itself quite sufficient to guarantee us against every idea of contagion in Cholera.

The quarantine laws, the last remains of the barbarous institutions of the middle ages, are still however maintained in all their rigour even in this our time of progress and civilization. These laws serve only for the protection of parasitical corporations, which prey on the vitals of society, sacrificing their victims to the remorseless fear of ignorant and timid populations.

Every one must admit that quarantines and *cordons sanitaires* are quite absurd when the disease exists already throughout an entire country as is always the case in epidemic Cholera.

What kind of protection or security do we obtain from quarantine even in epidemics of contagious diseases? Why should they be established at any time?

The lazarets are nothing more nor less than foci of infection for contagious diseases, which even political reasons should not tolerate.

When the yellow fever raged at New York in 1858, the Americans understood so well that the infection came from the quarantine that they rushed on the hospital of the Lazaret and set fire to it after having taken the patients from the building. *The epidemic ceased immediately.*

It is clearly demonstrated that the only certainty by which we can be protected from epidemics of contagious diseases is by the destruction of the means by which these diseases themselves are favoured, for *contagious diseases are propagated there only, where they find the elements of their existence.*

We have another convincing example in favour of our argument in the great fire of London in 1666, which destroyed the greater part of the city. The houses were at that time built of wood and projected, almost touching each other, over the streets, so that the atmosphere of the dwellings could never be thoroughly changed, and the Plague was quite an endemic disease, becoming epidemic two or three times every century. The

houses were rebuilt on better hygienic principles, and since then the Plague has never appeared in London, although the communications with infected countries are very much more frequent now than formerly.

The question of the application of quarantine laws to Cholera has led us to make these few observations on the quarantine laws in general. To return to our subject, Cholera, we must admit that although it is true, as we have already seen, that infection, poisons, miasmata, virus, &c., &c. (the means by which contagious diseases are propagated) have no influence whatever in the production of Cholera itself; these contagious, zymotic diseases, are often, however, associated with Cholera. There is no antagonism between Typhoid Fevers and Cholera, though they are of such a different nature, they often co-exist, and the typhoid character even predisposes to Cholera.

The etiology of Cholera is still veiled in great obscurity which we may hope to dissipate only by the close observation of all that passes in a patient affected with this disease.

We have already seen that the morbid action is sudden: the symptoms are those of collapse of the whole organism with an altered state of vitality and suspension of the functions of assimilation and disassimilation. We know of nothing but electricity which could strike so suddenly and

so deeply through the whole economy, without leaving any trace of organic lesion. This electric influence hovers over us, occupying certain zones, attacking isolated vessels, even at sea.

This opinion, far from being new, has been frequently enounced by the most learned physicians and the most scientific men of the day, particularly since the appearance of Cholera—d'Alambert, P. Brydon, Faraday, Lake, Oersted, O'Shaugnessey, Atkinson, Sir James Murray, Dr. Castle, of Boston, Mr. M'Cormach, &c., &c.

Electricity pervades everything in nature, organic as well as inorganic matter. As we have already established an analogy between the affinity of atoms and the vitality of the cells, so may we now inquire if this analogy may not be continued in the composition and decomposition of mineral substances, and in the assimilation and disassimilation of organic tissue. There is a development of heat and electricity in both cases, subject to the laws of chemistry in the first case, and to the laws of vitality in the other. The vital action, which is incessant in the healthy frame, must then cause a proportionate development of electricity. To how many changes is this development of electricity exposed? Innumerable causes from without and from within must affect this vital action: the *milieu* in which an individual lives; the moral, intellectual, healthy, or morbid state, must inevitably produce

corresponding changes in the electric state of the elements of the whole economy.

We are more or less affected by a change of atmosphere, independently of its pressure, its temperature, its dryness, or its humidity. Are we not continually passing from a state of languor, prostration, sadness, and depression, to a state of vigour, strength, joy, and courage, with a feeling of elasticity of body and mind, and an inward consciousness of indescribable happiness. All this under the influence of a sudden change which has taken place in the electric state of the atmosphere.

Assuredly, as long as we remain in a state of depression, we are exposed to all the morbid influences which may affect us, but when a favourable change takes place we feel a kind of reaction which gives us the power of resistance with a sensation of relief.

This general influence is undoubted, but still we are very far from being able to define the action of electricity on the economy. We are perfectly conscious, however, of its existence and of its power.

It is well known that the influence of the magnetic pole was considerably disturbed in Russia, and that a magnet which attracted a weight of 75 pounds, lost so much of its power during the height of an epidemic, that it could no longer

attract more than 15 pounds. This disturbed influence of the magnetic pole was recovered, and the power of the magnet restored, by degrees, as the violence of the epidemic abated. We know then that there is correlation between the electro-magnetic power and the cause of Cholera.

We may also attribute all epidemics, whatever the disease may be, to this cosmic influence. In epidemic Cholera, then, this influence cannot be denied, and from the nature, the seat of the disease, as well as from its peculiar character and symptoms, we feel authorized to recognise the same influence as the cause of Cholera.

Have we not also had epizooties and diseases of the vegetable kingdom within the last few years, which we never had before; the cattle plague, the potato rot, and the oïdium, which are all attributable to the same cause?

We have seen that a modified state of the electro-magnetic power appears with, and accompanies the progress of, an epidemic; that to its action also may be attributed the cause of Cholera. We shall now see that Sir James Murray, who has made the influence of electricity in the production of different diseases his special study for the last 40 years, attributes epidemics of an inflammatory character—rheumatisms, inflammatory fevers, bronchitis, ophthalmia, &c., &c.—to positive electricity, whilst he considers, *Cholera*, influenza, diarrhœa,

dysentery, yellow fever, typhoid and intermittent fevers, to be under the influence of negative electricity.

Dr. Castle most ingeniously represents by diagrams the choleraic action passing like lightning from one country to another over the whole surface of the globe, and in his remarkable work says "that climate and soil have nothing to do with the epidemic only in their respective properties as electric conductors, it being altogether produced by an electro-magnetic action and thermoelectric or telluric influences within and upon the crust of the earth." He attributes the cause and march of Cholera to these two influences.

It cannot be denied that such influences must produce their effect on organic life. Their special action, in producing Cholera has not yet been demonstrated. The effects, however, on the system are such that none but the subtle and powerful influences we have described could produce them. We see the effects of these influences extending over vast continents and zones. Dr. Castle, as an example, tells us that "H. B. M. S. *Undaunted* left Canton for the purpose of conveying the Governor-General of India to England. On her passage a number of her crew were attacked with Choleraic asphyxia. This continued for several days. The surgeon recommended the captain to change the vessel's course into another latitude, which being

done the malady immediately ceased. It is here worthy of remark that the ship was, previous to this, perfectly healthy, nor had the disease been in that part of the world for a considerable period previous to the *Undaunted's* visit. The ship *Anne*, of Newhaven, crossed the same line of latitude, when the Cholera appeared on board. The captain immediately bore away to a more southern latitude, and it immediately disappeared."

Every individual who is exposed to these influences does not contract the disease. There must be an individual predisposition. We have already said that "the moral, intellectual, healthy, or morbid state must inevitably produce corresponding changes in the electric state of the elements of the whole economy." Exhaustion, prostration, and fear must expose those persons who are under the general influence to be affected by the morbid action. Fear furnishes us with the most constant examples of this predisposition in every epidemic. Probably people were never more alarmed than in 1832, when Cholera first made its appearance in Paris. During the first few days the patients were carried off in two or three hours. The panic took a frightful form, and certainly caused the greater number of victims. Everything became an object of dread. The people were persuaded at one moment that the water, the provisions, the wine, everything was poisoned.

Amongst many other incidents of the time we will relate the following as an example :—A man was suddenly taken with Cholera in a wine-shop. The persons present, in a state of frenzy and with threats, obliged the unfortunate *marchand de vin* to drink a glass of his own wine. Overcome with fear he drank, and was immediately struck with Cholera. The mob rushed at once into the shop, demolished everything, and emptied all the wine from the cellar into the gutter.

We give only one more example of the effect of fear, which will furnish us at the same time with the most striking proof of non-contagion of the disease.

The English Government sent Sir William Russell to St. Petersburg when the Cholera first appeared there. Sir William states that the authorities ordered a certain number of condemned criminals to be placed in beds from which the bodies of Cholera patients had just been taken. The criminals were carefully kept in ignorance of this circumstance and were immediately afterwards sent to considerable distances from each other. Some of them were then told what had happened to them, all of these men died ; whilst the others, to whom this communication was not made, were not in the least affected.

Precautionary Measures.—From all that we know of the nature of Cholera, its etiology, &c., we

are persuaded that every effort should be made to prevent the population from becoming alarmed, and hygienic measures should be anxiously attended to as soon as an epidemic is to be feared. Cholera is not a contagious disease ; every one should be convinced of this. It would be advisable that persons imbued with this conviction should gain admittance to every house, through some pretext or other, so as to give confidence and security to families, and at the same time to seek for those slight cases in which simple, but prompt, measures are so highly efficacious.

The house-to-house visiting which has been in practice for several years, with the greatest advantage, in England, is, we believe, confided almost exclusively to medical men. These gentlemen cannot possibly suffice for this duty, and, moreover, their uncalled-for presence in families is objectionable during an epidemic—it is a legitimate cause for alarm. The visits of non-professional persons would, on the contrary, give strength and courage simply by this mark of sympathy and kindness.

We do not speak of those families who have their own medical men to guide and advise them at all times. We allude only to the poor, with their isolated families, amongst whom it is so difficult to establish those hygienic measures which, by their position, are rendered more particularly necessary.

It is not necessary to repeat the arguments we have established against the appellations "Cholerine," "Premonitory Diarrhœa." Every one should be warned of the insidious nature of this *intestinal flux*, and of the treatment it requires.

The dispensaries and public places from which medical assistance may be obtained, cannot render the services required during an epidemic. Medical assistance is never sought by the poor until it is too late, and the visit of a medical man cannot suffice under such circumstances. It is not so much the science and skill of a medical man that is required as a perfect change in the habits and life of the poor. They huddle together in one room, carefully closing up everything, papering up the chinks of the windows, and listing the doors, stopping up the chimneys, &c., perhaps with a stove for their little cooking.

This is how every room is, as it were, scientifically converted into a perfect laboratory of fermentation—a terrible focus of infection. All the bedding, all the clothes are saturated with the immense quantity of vapour continually seething from their bodies—perspiration, breath, gases, &c. It is this fermentation, putrefaction of animal matter, which gives that peculiar odour to the clothes which is called "the poor smell."

The atmosphere which these unhappy creatures breathe is thus almost entirely composed of this

poisonous vapour, with carbonic acid, and sulphuretted hydrogen, gases, &c. Their vitality is so reduced that they shiver as soon as they are exposed to the least contact of pure air, and they quickly creep back again to their dens of infection. They cannot be persuaded by any argument, for they are never satisfied except when they are in this state of intoxicating asphyxia, produced by their frightful vapour-bath.

These are the foci of all contagious diseases which are continually being kept up. How are they to be destroyed? Arguments and persuasions are of no use, for the poor will always huddle together in the same way. The poor, moreover, are the most susceptible of all classes of society; they can be approached only by acts of sympathy and active charity, by assisting them in their difficulties and attending to their sufferings, practically changing their mode of life, without any explanation or attempt to persuade.

Authority has no power here. All the improvements which may be made in the dwellings of the poor are necessarily very limited—whatever they may be, they can be but very temporary, for these unhappy creatures will immediately relapse into their former habits. No hope can be entertained of any radical reform, any permanent good, by any other means than by frequent visits amongst them, obliging them, imperceptibly, to change their mode

of living. They require to be roused from their isolation—to be made feel that they are not abandoned and rejected. This is the object of true active charity which raises the moral, so differently from the negligent and indifferent alms-giving, which serves only to degrade the poor, to encourage vice and misery.

The most favourable time, the real opportunity, for the exercise of this active charity, is in the time of sickness, by attending patients in their own homes. An intelligent nurse, under the direction of the noble Sisters of Charity, by attending to all the wants of the sick, making the different members of the family assist in cleaning the rooms, lighting the fires, opening the doors and windows, destroys those foci of infection so much to be dreaded by the community. A permanent change will thus be obtained in the besotted habits of the poor, whilst at the same time there is every advantage to be gained by the attendance on the sick in their own homes. This is demonstrated by the fact that the mortality is much less with patients thus treated than in the hospitals. (In their homes 33 per cent., and 53 per cent. in the hospitals.)

In times of great visitations, the presence of the highest personages amongst the sick raises the moral courage, gives life and energy to the poor, thus assuaging the violence of epidemics.

We have just witnessed the most admirable effects of this powerful influence from the visits of H. M. the Emperor Napoleon to the Hotel Dieu, and of H. M. the Empress to the Beaujon, Lariboisière, and St. Antoine Hospitals in Paris, and to the hospital at Amiens. There is no doubt that many patients whose cases were absolutely despaired of, were roused to a state of reaction, and their recovery was wholly attributable to the effect of the presence of these august personages.

The effect produced by the presence of their Majesties was so great that we could scarcely avoid citing it as an example of immense moral power which might be imitated on similar occasions ; also, the observations we have made on the benefit to be derived from attending the sick poor in their homes are, we are persuaded, of such importance, that our digression has been almost necessary though bearing only indirectly on our subject.

The sick poor are not, however, attended in their own homes ; in fact they never can be ; the greater part of them, always the worst cases, must be sent to the hospitals. The hospitals are overcrowded immediately on the appearance of an epidemic, and become foci of infection for contagious diseases. We would suggest, then, that instead of putting in additional beds, their number should be diminished, in each ward, and that sepa-

rate houses should be prepared in every district for the reception of patients. By this means all the epidemics of contagious diseases would cease, and, in Cholera cases, the patients would be in a much more favourable condition for their treatment.

With regard to disinfectants, as a preventive measure, we reject them altogether. All the experiments which have been abundantly tried have sufficiently proved their thorough inefficacy. The fumigations of chlorine would appear to be not only inefficacious, but really injurious, "all the men employed in some laboratories in the preparation of this substance (chloride of lime) died." (*Cholera Morbus*, Fabre, p. 222). The enormous quantity of chlorate of lime which is found in every corner of the streets of Paris, serve only to infect the atmosphere and frighten the people. There is nothing in Cholera to disinfect, and under all circumstances, there is but one absolute disinfectant, and this is cleanliness.

Treatment.—Every rational treatment must be based on the knowledge of the seat and nature of the disease. From the sketch we have presented of the symptoms and pathology of Cholera, it appears to us evident that the seat of the disease is in the elementary cells of the whole economy, and that its nature is derived from the vitiated state of these cells. The treatment then must consist in combating this vitiated state, and the means to be

employed will always be at hand when we have a distinct object in view.

We shall abstain from naming the immense number of medicines and prescriptions which have been employed in the treatment of Cholera. They would fill a large volume.

The Materia Medica offers us two great classes of medicines : those which act directly on the system, and those which produce no effect until they have undergone an elaboration in the economy. The medicines of this last class can have no power of action in cases of Cholera, from the fact that all the functions are suspended, and they cannot be elaborated. Those medicines only can be rationally employed which produce a direct and immediate action on the system. It is simply a delusion to depend on the dynamic power of medicine in cases of Cholera : *e. g.* in the administration of mercury, not one atom, in the form of calomel or otherwise, was ever absorbed by a Cholera patient after the first period of the disease.

In confirmed Cholera the intestinal canal is quite in a passive state ; there is no longer any absorption, so that all the medicines which require to be assimilated before they can act on the system must necessarily pass through the bowels, without producing any effect. This is how we can account for the immense quantity of sub-acetate of lead, two ounces, which Dr. Boudin administered daily

to his patients, without producing any deleterious effect.

Our remedies must then of necessity be those of the first class, which act immediately on the system, and every effort must be made to obtain a reaction as promptly as possible.

There are a great number of medicines of this first class, amongst which we find ethers the most powerful and applicable in Cholera, from their prompt and penetrating action, which rapidly passes off, allowing the dose to be repeated frequently, and that without the least injurious effect on the system.

The ethers, ammonia, alcohol, the tinctures and infusions of aromatic plants, camphor, coffee, tea, wine, brandy, liquors, ipecacuanha, the sulphuric and hydrochloric acids, furnish us with all that we may require ; opium and its preparations should never be employed except in the first period of the disease.

First Period.—All the inhabitants of any region over which the choleraic influence hangs must in some degree be affected by it. This choleraic influence is in general so slight that the derangement of the functions may not be observed. This insidious nature of the affection renders it the more necessary, however, that the first symptoms should be attended to as promptly as possible : the habits of life should be regulated, the hygiene should be more cared for than usual, every kind of excess

which exhausts the vital powers should be avoided, people should live well, and their spirits should be kept up.

No time should be lost when the first symptoms become more marked : warm drinks, infusions of camomile, tea, violets, some camphor julep, a little brandy, rum, or any other kind of spirituous liquor in hot water, heated flannel applied to the abdomen—such remedies, with a little repose, are generally sufficient to obtain the desired effect.

The tongue is in general clean, far from being warm and dry, it is disposed to be cool, and the circulation is already rather languid. The system must be supported, and a certain degree of reaction obtained. If the means already employed do not suffice, it would be advisable to produce a slight general commotion by the administration of one or two scruples of ipecacuanha ; and if after this the intestinal flux should continue, eight or ten drops of chlorodyne, with three or four drops of sulphuric or hydrochloric acid in an ounce of water, might be given with advantage every two hours, or after each evacuation.

Our usual prescription is as follows :—

R Tincturæ cardamomi comp :

Syrupi corticis aurantii āā ʒi.

Vini opii (Sydenham) ʒiiss.

Acidi hydrochlorici gttas xx.

Chloroformyli ʒiiss.

ft mistura ejus capiat cochlearo unum minimum cum aquæ uncia
una, post singulas sedes liquidas ; agitata phialâ.

During the first period of the disease the disturbance is so slight that the patients often preserve their appetite. Under such circumstances it would be advisable not to change their regimen, for this intestinal flux is absolutely a passive state. There could be no necessity then for imposing any particular regimen, unless there should be some complication. Good wine should be allowed: Burgundy and the warm southern wines, the Spanish and port wines are the best.

Under all circumstances, with or without complication, every effort should be made to obtain and keep up reaction.

We have ventured to give these minute details, because it is of the first importance to cut short the disease whenever it is presented to us in this, its first period, and most assuredly the simple means we have recommended are preferable to all empirical remedies.

We entered fully into the peculiar character which should be given to the house-to-house visiting, precisely because this is the best means we can employ to discover these insidious cases, and to bring them immediately under proper care.

Second Period.—Confirmed Cholera.—When the disease presents itself fully characterised, we must redouble all our efforts to obtain a reaction. Gentle and continued warmth, by the administra-

tion of warm drinks, and by external applications. The patient should be stripped, and, with two or three india-rubber bottles filled with hot water, should be well wrapped in thick woollen blankets. In addition to the warm drinks already named, we must now add ether or chloroform. The best form in which these ethers can be administered is in capsules of gelatine called *perles d'ether*. When ether is administered in any other way, the greater part of it must inevitably be evaporated before it can reach the stomach. One of these capsules may be taken every hour, or even every half-hour, conjointly with the other remedies. Enemas of ether are the most efficacious of all remedies; our form of administration is from half a drachm to a drachm of ether to four ounces of cold water, which should be slightly shaken in the syringe before it is administered. The patient immediately feels an intense heat, which reacts through the whole frame, and this without producing the least irritation of the intestines.

We think that all cutaneous revulsives, mustard poultices, &c., do much more harm than good, because their application necessarily obliges the patient to be uncovered, and thus interrupts the action of gentle warmth, which, above all things should be perseveringly encouraged.

All the other revulsives, blisters, cupping, &c., should be countermanded on the same principle;

moreover, these applications are by no means as efficacious in rousing organic action as the effect of general warmth. The vesications often assume a bad aspect when the reaction is not well supported. These large sores exhaust the patients and hasten their death when the disease takes a typhoid character.

We have never witnessed any positively good results from galvanism. Warm baths are fatiguing and, like the warm-air baths, expose the patients to inevitable changes of temperature, which are always injurious. These baths can only be continued for a limited time, and therefore they cannot answer our purpose.

Frictions with the palms of warm, dry hands, passed under the blankets, give great relief in dissipating the cramps and in assisting the circulation of the blood which is stagnant in the large veins.

Chlorodyne is an admirable preparation, in which opium is advantageously combined with aromatics and chloroform. This medicine which is certainly of the greatest service in the first period of the disease must, like the other preparations of opium, be countermanded at all other times. The function of absorption is entirely suspended in cases of confirmed Cholera, so that repeated doses of this medicine may be accumulated in the stomach and intestines, and if a reaction should be obtained the patient will most assuredly be carried off by

the absorption of the quantity of opium present in the system.

The violent sickness and the burning pain in the epigastric region are appeased by frequently swallowing small pieces of ice after having kept them a short time in the mouth. Patients often consume a considerable quantity of ice in this way, and drink a great deal of cold water, which they ask for instinctively, and from which they derive great benefit. The intestinal flux is not in any degree increased by this indulgence. Moreover, we are not so much preoccupied with this intestinal flux itself as with its source, and this source is not to be found in the intestinal canal, but in the whole economy. It is by reaction only that we may hope to overcome it. As soon as reaction is established the intestinal flux ceases.

Third period—Asphyxia. As in the other periods, so now in this, the worst, the most aggravated state of the disease, the object must be to endeavour to obtain a reaction by the steady employment of the means before recommended.

It need scarcely be observed that the administration of opium and the application of blisters are here precluded by all the principles of therapeutics. The ether enemata should be frequently repeated; the *perles d'ether*, sal-volatile, lemonades prepared with the mineral acids, are the remedies chiefly to be

relied on, with brandy, rum, or liquor of any spirituous nature, greatly diluted with warm water, and ice to arrest the vomiting; the frequent application of warmed flannels over the abdomen and chest. Vomiting produced by the administration of ipecacuanha may still effect a favourable commotion; but if the stomach remains insensible to its action, the prognosis becomes of the most unfavourable nature.

Fourth period.—Reaction.—There is no fourth period, properly speaking. We have been obliged to place the period of reaction after the others, simply because it is by reaction only that patients can recover after any period. The reaction takes place more easily and much more frequently after the first period than after the second, and again with much greater difficulty after the third than after the two preceding periods—the whole organism is called upon to make its greatest efforts just when it is in its greatest state of prostration.

We have never been able to discover any good effect from the abstraction of blood in any form. It appears to us quite inapplicable to the nature of the case, for the simple reason, that it is only the most liquid part of the blood, that which is the least vitiated, which could be withdrawn, and consequently by its absence, we render the circulation physically more difficult.

Hematosis is the first and most important function to be re-established, for by it the venous blood recovers its life-giving qualities, and thus reanimates the whole system. To favour and support this important function we must allow only good, pure, fresh air to penetrate the lungs. The atmosphere of the room should be between 65° and 70° Fahrenheit, and frictions should be made on the limbs to assist the circulation in its movement towards the heart.

The great difficulty to be overcome is in fact to put in movement this immense quantity of thick carbonised blood, and to restore it to its physiological character before it is carried again through the whole system. The accumulation of this enormous quantity of morbid blood in the large venous trunks constitutes those passive congestions, which are often the insuperable obstacle to the continued reaction.

The peculiar nature of these passive congestions appears to us so patent that it seems impossible to attribute them to the effect of the stimulants which the patient had taken to produce reaction. The collapsed state of the patient occasioned by the presence of blood saturated with carbonic acid, could scarcely be mistaken for intoxication produced by alcohol. It is evident that the organs must remain insensible, and that no stimulant could reach them until they were freed

from the accumulated quantity of black blood which keeps them in a state of asphyxia.

The great argument, then, employed against stimulants, on the supposition that these passive congestions are the consequences of their administration, is without foundation.

As soon as organic sensibility is roused, great care and caution must be observed in the use of stimulants of all kinds. The patient should be kept quiet and sustained by small quantities of light food, broths, &c., so that the reaction may be as gentle and mild as possible, thus allowing the organs time to become habituated again to their natural stimulant—arterial blood. Tea, coffee, the infusions of warm aromatic plants, camphor julep, the acetate of ammonia, &c., are the principle medicines to be employed under such circumstances.

Notwithstanding every precaution, sometimes local inflammation, accompanied with some degree of fever, sets in, when it has been thought necessary to moderate the reaction by small bleedings. This is an extremely difficult question, requiring the greatest medical tact. We have, however, generally seen this accidental kind of inflammation dissipated by the application of large, dry, cupping-glasses, and perhaps the administration of some slight purgative medicine—a seidlitz powder, or half-an-ounce of castor oil. We abstain as much as

possible from the abstraction of blood, even under these circumstances, for this apparently too violent reaction is quite ephemeral, and the patient easily lapses into an adynamic state. With reaction Cholera disappears, and the adynamic state, the consequence of reaction, assumes a typhoid character. We must therefore have recourse to quinquina, and all the means usually employed in the various forms of typhoid fever.

In the midst of the most favourable reaction, even when everything appears most promising, a relapse of Cholera often takes place. Unhappily this cannot be foreseen or guarded against. It appears to us more like a second attack than a relapse, which seizes the patient under the most unfavourable circumstances. We have no other resource than to endeavour to obtain a reaction again, by the means already employed—our efforts are almost always in vain.

Convalescence is always long and difficult after the second and third periods of Cholera, but there are no particular indications to be attended to, unless from some organic predisposition, or accidental illness, which would then place the patient under treatment for some other disease quite of a different nature from Cholera.

In concluding this short treatise, we venture to offer the following propositions, in which we hope to convey, in as clear and concise a manner as

possible, the principles which have directed us in our researches on this difficult subject.

I. The symptoms of Cholera are the expression of a disturbed state of the vitality of the whole economy.

II. The invasion is sudden ; there is no period of incubation or precursory symptom.

III. The intestinal flux is the first, and often the only appreciable sign of the disease in light cases. This intestinal flux has no relation whatever to diarrhœa.

IV. Diarrhœa is the result of increased action of the intestinal canal. The evacuations always contain stercoraceous matter.

V. The intestinal flux is nothing more than the evacuation of the accumulated serum from the intestinal canal, which is become a *passive recipient* under the influence of Cholera—no stercoraceous matter.

VI. Cholera is divided into three periods ; the first is the intestinal flux ; the second is that of confirmed Cholera ; and the third of asphyxia, algide Cholera ; the fourth, that of reaction, does not in reality belong to the disease.

VII. All the functions are affected at once ; organic action ceases, and all the secretions are suspended ; slightly in the first period, in a marked manner in the second, and in the highest degree in the third.

VIII. There is no cure for Cholera but by

reaction, which is almost imperceptible after the first period, accompanied by fever after the second, and this fever of reaction is almost always adynamic after the third.

IX. There is no organic lesion. The whole economy is reduced to a passive state, stagnation, and decomposition of the blood in the large vessels, even before death, ecchymosis, and psorentery.

X. The blood has lost its physiological character. It does not coagulate, forming a clot, which floats in the serum; it does not become buffy; the fibrine is dissolved, and forms a kind of jelly with the globules and the small quantity of serum which remains. The red globules are shrivelled from the loss of their serum by exosmosis.

XI. The air expired by Cholera patients is not in the least changed; it has the same chemical composition as the atmosphere, but it is at 4° or 5° below the temperature of a warm room.

XII. The pathological cold which seizes patients disappears after the cessation of the choleraic influence. The animal heat returns for a short time, *vi vitæ*, even after the decease.

XIII. The suspension of all the secretions and of all organic action renders the process of elaboration impossible. There cannot then be any period of incubation; no virus, no miasma, consequently no contagion nor infection.

XIV. The suspension of organic life, more or less violently arrested by choleraic influence, and the reaction which follows after the cessation of this influence, even after the functions of the brain, the heart, and of the whole economy have ceased, show that the elementary cells are the seat of the disease.

XV. The irregular course which Cholera takes, passing through immense space like lightning, renders all quarantine measures against this disease perfectly illusory.

XVI. Contagious diseases are propagated there only where they find the elements of their existence. Protection against epidemics of these diseases must consist then in the destruction of the foci of infection, rather than in the establishment of quarantines.

XVII. The morbid action producing the more or less collapsed state of the whole economy appears to be the effect of electric action.

XVIII. There exists some correlation between the electro-magnetic and the choleraic influence. The magnetic pole loses its influence, and the magnet its power, during the reign of epidemic Cholera.

XIX. It is probable that inflammatory diseases are developed under the influence of positive electricity, and that adynamic affections, amongst which is Cholera, are under the control of negative electricity.

XX. A very great resemblance exists between the effect of fear and Cholera : sudden seizure of cold, intestinal flux, and collapsed state of organic life.

XXI. The only means of precaution at present known, after the execution of all the ordinary hygienic measures, is to support the moral courage of the people in establishing the conviction that Cholera is not a contagious disease. With regard to disinfectants, there is nothing to disinfect in Cholera, and under all circumstances there is only one disinfectant, which is cleanliness.

XXII. There is no other cure for Cholera patients than by reaction. The rational treatment consists, therefore, in obtaining and in supporting this reaction. Stimulants of all kinds and warmth are our great resources.

XXIII. Opium and its preparations are countermanded, except only in the first period of the disease. The accidental presence of a large quantity of opium in the system is often the cause of death by absorption as soon as reaction has taken place.

XXIV. Mustard poultices and blisters are countermanded, as well as all revulsives. They interrupt the action of warmth by exposing the patient, and the vesications are often the source of great embarrassment and danger after reaction has taken place.

A P P E N D I X.

[Extracts from the *Medical Times* of Dr. Beale's most interesting researches, which so fully establish the pathological character of the disease.]

“ MICROSCOPICAL RESEARCHES ON THE CHOLERA.
BY LIONEL S. BEALE, M.B., F.R.S., FELLOW
OF THE ROYAL COLLEGE OF PHYSICIANS, ETC.

“ Every one who has seen Cholera has been struck by the remarkable characters of the matter discharged from the intestinal tube, and those who have made post-mortems are familiar with the fact that the small intestines almost always contain a considerable quantity of pale, almost colourless gruel-, rice-, or cream-like matter. This has been proved to consist almost entirely of columnar epithelium, and in very many cases large flakes can be found, consisting of several uninjured epithelial sheaths of the villi. I have often found such sheaths in the stools in previous epidemics, and probably, every one who has carefully observed the disease will have inclined towards the opinion that in bad cases it is probable that almost every villus, from the pylorus to the ileo-cæcal valve, has been stripped of its epithelial coating during life.

“ This alteration in the apparatus concerned in the absorption of all nutrient matters from the intestinal canal, and the changes accompanying it and preceding it, are probably sufficient to account for death by collapse. Most important, therefore, is it to ascertain, if possible, the several phenomena of which this denudation of epithelium is the climax, and the order in which they occur. These important organs, the villi, are, in a very bad case, all, or nearly all, left bare, and a very essential part of what constitutes the absorbing apparatus is completely destroyed. If only a considerable portion of a villus was denuded, reparation might doubtless occur by new growth from the cells which remained, but if the villus was entirely stripped, it is more probable that it would waste, and its place be at length occupied by a new one, which would grow from its base, than that epithelium would grow anew from its bare surface. It is probable that the extent of this process of denudation determines the severity or mildness of the attack. If the great majority of the villi have suffered, it is scarcely reasonable to consider recovery more probable than it would be after a very extensive burn or scald. We shall have to inquire what is the proximate cause of the denuding process? Why does the epithelium drop off? What circumstances cause it to become detached? The process may be due to violent contraction of the muscular fibres of

the villi and the retraction of the villus within its sheath ; but although, no doubt, contraction occurs, it is scarcely probable that the villi would be so generally and completely stripped as they are in severe cases. It seems more probable that the epithelium may become detached in consequence of the almost complete cessation of the circulation in the capillaries beneath, but the death of the cells may occur in consequence of their being exposed to the influence of certain matters in the intestine or in the blood, in which case they would simply fall off. These and many more hypotheses will have to be considered in the hope of finding the true explanation of the fact.

“ It ought not, I think, to be too hastily concluded that this abundant removal of epithelium is an indication of the occurrence of active *elimination* from the intestinal surface. For, in the first place, it must be remembered that the villi are not, in their normal state, organs of *secretion* or *elimination*, but active organs of *absorption* ; while, on the other hand, Lieberkuhn’s follicles, which open in the intervals between the bases of the villi, are secreting organs. Now these follicles, so far from being denuded, are choked with epithelium. It is possible, however, that there may have been a tendency upon the part of these cells to separate matter from the blood, but it seems improbable that the columnar cells which form the bulk of the

cellular elements of the contents of the small intestine, and which unquestionably come from the villi, should have been engaged in such an office. Secondly, I would remark that the pabulum passes through the columnar cell in a direction *from* its free towards its attached surface, or *from the intestine towards the blood*. If, therefore, it eliminates or separates anything from the blood, the flow must take place through it in a direction the very opposite of that which is constant during its life. Is it not improbable that this should be the case? In short, it seems to me that evidence in favour of the view that the removal of the epithelium from the villi is an eliminative act is still wanting. By the denudation a raw surface becomes exposed, just as in the case of the cutaneous surface after a burn or scald, except that the villi are completely bared, which is not the case with the skin. No one would argue that the elevation of the superficial layers of the cuticle and the effusion of serum beneath consequent upon a burn resulted from elimination. We are to some extent acquainted with the several steps of the latter process, but we have not as yet learned much concerning the former.

“ The removal of the columnar epithelium from the villi, and the consequent destruction of the mechanism connected with absorption, are broad facts in Cholera which deserve the most minute

and careful study. We might well consider how this denudation may be prevented or retarded, and, having taken place, what fluids should be brought into contact with the naked surface—oily fluids, fluids containing salt, syrup or glycerine, so as to make them of about the specific gravity of the serum, or ordinary serum itself, which last would probably be most efficacious—or whether it would not be better, until we know more of the matter, to let the denuded villi remain perfectly quiet, and allow the small intestine to rest, in the hope that the damage may be repaired. But is it not reasonable to hope that a thoroughly minute investigation into the circumstances which probably immediately precede this denudation of epithelium would enable us to form a notion of its nature, and to adopt means which were likely to restrain it? A knowledge of the changes occurring after the denudation and destruction of many villi will probably teach us much concerning the nature of “secondary fever,” and enable us to place the patient under conditions most favourable to his recovery. The consideration of the mere fact of there being a raw denuded surface throughout a considerable extent of the alimentary canal suggests the propriety of not introducing anything into the intestines. The question concerning the alteration in the villi is a most interesting one, and it is worth while to spend time in searching for new

facts, and in trying new experiments which may help us to answer it. But the subject is a very extensive one, and has many ramifications, each of which must be carefully considered in detail.

“ Remarkable changes have occurred in the smaller vessels, especially in the capillaries and small veins of the villi and submucous tissue, and these changes can be readily demonstrated. The blood-corpuscles appear to have, in great measure, been destroyed in the smaller vessels, and in their place are seen clots containing blood-colouring matter, minute granules, and small masses of germinal matter evidently undergoing active multiplication, but the nature of which has yet to be studied. Some of the arteries are contracted, but here and there small clots, destitute of blood-corpuscles, may be seen at intervals. Drawings of these will be published.

“ On the other hand, the nerves and the ganglia, so numerous between the muscular and mucous coats of the small intestine, exhibit a natural appearance, so that I should not be able to distinguish a ganglion taken from a Cholera victim from one taken from a perfectly healthy person of the same age whose life was destroyed by accident. The nerves and ganglia, and the tissues for a short distance around the smaller vessels, are, in many situations, stained with altered and dissolved blood-colouring matter.

“ I propose to give an account of what I have observed in the villi in Cholera, and institute a careful comparison between these and perfectly healthy villi. I shall have illustrations made, and these will be published as soon as they can be engraved. The results of the examination of the liver, lungs, and other organs will follow as soon as the investigation can be completed.

*Of the Columnar Epithelial Cells detached
from the Villi.*

The columnar epithelial cells found in great number in the rice-water evacuations and small intestine after death from Cholera do not always exhibit the same characters, nor are they of the same size in every case. In the accompanying drawings (Figs. 1, 2, 3, and 4) cells of the smallest and largest dimensions and cells of medium size, taken from the first four cases I have examined, are represented. All these specimens are magnified with the same power. Case 3 was a child fifteen months old ; and it will be observed not only that the epithelial cells are much larger than in the three other cases, but that the nuclei are larger in proportion. See also Fig. 6, in which these cells are seen under a power of 700 diameters.

In almost all the cases of Cholera I have yet

Fig. 1.



CASE 1.

Fig. 2.



CASE 2.

Fig. 3.



CASE 3.

Fig. 4.



CASE 4.

Figs. 1 and 2—Epithelial cells from jejunum magnified 215.

Figs. 3 and 4—Epithelial cells from jejunum, magnified 215.

Fig. 5.



Fig. 5—Epithelial sheaths from the villi, from the jejunum, about a foot from the pylorus Case 3, age 15 months. Magnified 130.

Fig. 6.

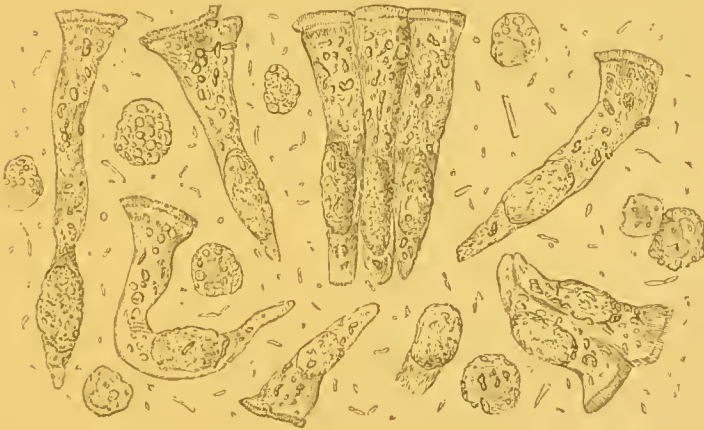


Fig. 6—Detached columnar epithelial cells and small cells, from the jejunum, about a foot from the pylorus. Case 3. The cells contain numerous altered oil-globules. Between the cells are seen bacteria, which were alive, and exhibited active movements. Magnified 700.

Fig. 7.



Fig. 7—Summit of columnar epithelial cell, showing bodies within like bacteria germ. a, thick summit of the cell, exhibiting longitudinal striae, supposed by many to be pores, along which nutrient matters pass from the intestine and gain access to the interior of the cell. b, free bacteria. Magnified 1800.

examined there is evidence of chronic structural change in the *tissues* of the intestines, and I think we shall be led to conclude that in most of the Cholera victims important morbid alterations have been going on for months, and in some instances for years before death. In some cases it is probable that, had the individual escaped Cholera, he must have succumbed to some other malady within a short period of time.* The columnar epithelial cells often exhibit evidence of chronic change; they seem to be stunted, and in many instances the nuclei are much smaller than in health. In the intervals between their attached extremities one fails to find those smaller and younger cells which in the healthy state gradually grow up to take the place of those cells which are removed and give origin to new cells, which in their turn become developed. So also it is to be observed that the masses of germinal matter so numerous near the surface of the healthy villus are almost absent in many of these cases of Cholera. And there are other and very striking changes in the

* We venture to differ from Dr. Beale on this one point: it appears evident to us that this structural change, without reference to any other morbid condition, must depend on the degree of asphyxia with which the cells are struck, and that their altered state may be accounted for by the violence of the sudden attack. This will also account for all the phenomena observed in Cholera—the detached epithelium, the stunted cells, the diminished volume of the nuclei, &c.

structure of the affected villi which I shall describe fully in other communications.

The specimens, however, from Case 3 afford an exception to the above remarks ; but until I have had further opportunities of examining the epithelium in fatal cases of children at the same age, I cannot venture to draw conclusions. For the present, therefore, I content myself with publishing the drawings. In this Case 3 the epithelial sheaths of the villi were very distinct and perfect (Fig. 5), but the cells did not exhibit the characters seen in the other three cases. They contained numerous oil globules, some of which were of considerable size—a fact which perhaps justifies the inference that these particular cells were active and concerned in absorption shortly before death, which certainly is not usually the case in Cholera. The above inference is confirmed by the characters of the villi existing in this particular instance. In most cases the fresh cells seem to be almost destitute of oil globules, and many present a shrivelled appearance, as if they had not been very active for a long time before death. There seems, indeed, to be the same sort of difference between some of these cells in Cholera and healthy columnar epithelial cells, that is observed between the epithelium of a cirrhose and that of a healthy liver or kidney.

Of the Bacteria in the Stools, Vomit, and in the Small Intestine in Cholera.

Amongst the epithelial cells and upon their surfaces, if not in their substance, are multitudes of bacteria. Bacteria are found in the dejections during life, in the vomit, and in every part of the alimentary canal two hours after death.

It is probable that these organisms are developed in the intestine in vast numbers during life.

In Fig. 7 some of the smallest are represented as they appeared under the $\frac{1}{2}$ object glass. The bodies seen near the summit of the columnar epithelial cell are either germs of the same kind of bacteria or altered oil-globules.

The falling off of the epithelial cells cannot be attributed to the influence of bacteria, nor is it probable that these organisms are concerned in the production of Cholera. Bacteria are found often enough in undigested or in imperfectly digested food. In dyspeptic infants they occur in vast numbers in every part of the alimentary canal; and in temporary stomach derangement the matters rejected by the stomach or passed per anum contain them in enormous quantity. They have been observed by Dr. Gibb even in milk immediately it was removed from the breast of the mother, and must have been developed while

the milk yet remained in the mammary gland. They are always present in the fluids of the mouth, and are not uncommon in the contents of the stomach, though it is doubtful if they multiply in a perfectly healthy condition of the gastric mucous membrane. It is not very surprising that bacteria should be present in the cells of columnar epithelium in certain cases, seeing that their germs are always present in the old cells of squamous epithelium in the mouth. They invade these columnar cells from without, and live at their expense, just as they invade the epithelial cells of the tongue, and as simple fungi invade the cells of higher plants and animals when these cells begin to decay or lose through disease their healthy power of resisting invasion.

Bacteria are constantly found in every part of the living body where a tissue is no longer permeated by the fluids, whose office it is to maintain it in a state of integrity. Soon after the currents of fluid have ceased, especially where the organic material is soft and easily decomposed, bacteria make their appearance, and grow and multiply rapidly. Nor is there a tissue or organ in the inmost parts of the body in which these organisms may not within the course of a few hours make their appearance. The germs are there; but so long as the normal state of things continues, these germs are prevented from being developed.

These simple living organisms are without doubt destroyed in the healthy condition, although their germs may resist destruction. If the latter were to get into the healthy blood they would not multiply, but towards the close of many exhausting diseases, both in animals and man, after the blood has undergone important changes, they are found in great numbers. It is, however, doubtful if in any case they can be regarded as the cause of the disease, or the *materies morbi*, and it is far more probable that a change takes place before these organisms can multiply in the blood, and that a condition of things becomes established which is favourable to their growth and multiplication.

There is then, I think, no good reason for supposing that the bacteria in such numbers in the alimentary canal in Cholera have anything to do with this disease, or with the falling off of epithelium from the intestinal or other mucous membranes. Bacteria are developed in organic matter which is not traversed and protected by the normal fluids of the body, and they invade the cells and textures in Cholera after these cells and textures have undergone serious prior changes, just as they would invade textures removed from the body altogether. Nor would it be in accordance with known facts to infer that Cholera was due to the invasion of some peculiar form or species of bacterium.

Such hypotheses as this I believe to be absolutely untenable, and think they may be positively dismissed as mere fancies likely to mislead us in searching for the true cause of the disease. The idea of "*fermentation*" in the present day is so different from that generally entertained five-and-twenty years ago, that the word ought never to be used in modern scientific writings without being defined. The mere *multiplication of particles* is not peculiar to ferments. It is an attribute possessed by yeast in common with everything that has life, and therefore in this sense the word may be applied to every kind of cell-multiplication in nature. If the act of multiplication of the virus of small-pox or scarlatina be termed "*fermentation*," surely the multiplication of pus or mucus must be an example of fermentation, and if so every kind of cell-increase may be called "*fermentation*." If, however, this word is to be applied to the process in which carbonic acid and alcohol are evolved during the multiplication of a fungus in a saccharine solution, it is utterly inapplicable to the changes occurring in any disease affecting man or the higher animals. To speak of small-pox, or fever, or Cholera, &c., as due to ferments, conveys no real information whatever. By giving such pretended explanations of phenomena of which little or nothing is really *known*, inquiry is terribly discouraged, and real progress effectually checked.

The explanation offered requires explanation as much as the phenomenon itself. The explanation is not an explanation. It is a mere word, the meaning of which requires to be explained.

Cholera seems to be so constantly associated with the removal of columnar epithelium from the villi, that we have been led to look upon this as one of the *essential* phenomena of the disease. Although there may be no actual diarrhoea, this epithelium is found in quantity in the intestine after death. It may be said that this removal of epithelium occurs immediately after or only just before death, but the great number of columnar epithelial cells and entire sheaths of the villi so frequently found in the rice-water evacuation, giving to it its peculiar character, proves that such a notion is not tenable. Can Cholera exist without the villi being denuded of their epithelium,—is a question which, as far as I know, has not yet been answered, but which must be answered before we can form a correct notion of the nature of this most wonderful disease. I do not think there is any other morbid condition in which this striking change is observed—at any rate, to the extent or with the frequency it is met with in Cholera. It seems, however, likely that where those changes in the blood occur very quickly indeed, so as to cause death by sudden stagnation of the blood in the capillaries of important organs, there might not be time even for

the removal of the epithelium from the villi, just as we may have death from small-pox or scarlatina without any eruption.

With reference to the denudation of the villi, it must be borne in mind that the throwing off of epithelium is not confined to the villi of the intestine, or to that of the intestinal mucous membrane generally. The process affects the mucous membrane of the gall-bladder and larger gall-ducts; that of the bladder, ureters, and pelvis of the kidneys, as well as that of the Fallopian tubes, uterus, and vagina. In short, there seems a tendency to the removal of epithelium from the surface of all the soft, moist mucous membranes; not, it must be remembered, of the epithelium which is specially concerned in *elimination*, but rather of that which lines the *ducts* of glands and cavities which may be included in the category of the ductal portion of the different secreting glands.

On the other hand, there is no evidence of the increased formation or more rapid removal of the secreting epithelium in the various glandular organs. The follicles of the mucous membrane of the stomach and intestine, those of the salivary glands and pancreas, the tubes of the liver, kidney, and other glands still retain their epithelium; nor have I been able to demonstrate in these varieties of glandular epithelium any appearances peculiar to Cholera. Indeed, so far as I have yet been able

to observe, it would be extremely difficult to distinguish many secreting cells taken from the bodies of Cholera victims from perfectly healthy cells.*

* The quantity of epithelium which is detached from the villi of the intestinal canal, and from the surface of the soft moist mucous membrane, may be accounted for by the maceration which these parts undergo as soon as they are affected by the asphyxia of Cholera, and therefore this pathological state remains after decease.

This cannot be so clearly demonstrated in the tissues which are not in the same condition of moisture and maceration, for as the epithelium had not been detached during life and as these cells cannot be examined until after reaction has taken place, it will be extremely difficult to detect their real pathological state in Cholera; that they are affected is however clearly demonstrated by the symptoms of the disease and by the reaction which takes place even after decease.



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